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NAVAL AIR DEVELOPMENT CENTER

WARMINSTER, PA. 18974

SYSTEMS DIRECTORATE

TECHNICAL MEMORANDUM SD-16-82 30 SEPTEMBER 1982

FIFTH VP FUEL CONSERVATION QUARTERLY REPORT
(June 1982 - August 1982)

SUPPLEMENT

DEPARTMENT OF THE NAVY
NAVAL AIR DEVELOPMENT CENTER
WARMINSTER, PA. 18974

SYSTEMS DIRECTORATE

TECHNICAL MEMORANDUM SD-16-82 30 SEPTEMBER 1982

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SUPPLEMENT

This effort is being conducted for:

NAVAL MATERIAL COMMAND
Department of the Navy
Washington, DC 20360

Program Element 64710N
Project Number Z0371
Task Area Z0371-0000
Work Unit GH420

With assistance from Keystone Computer Associates, Inc. under Contract No. N62269-81-C-0115 Task Order No. 0005

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Chief, Sys Des Div

EXECUTIVE SUMMARY

Naval Air Development Center (NAVAIRDEVCEN) has been tasked by Naval Material Command (NAVMAT-08E) to examine changes in operational concepts, payloads, equipment and tactics that reduce fuel consumption. As part of this task NAVAIRDEVCEN has developed a data base to track fuel consumption for the VP community. The data base is used as a means of documenting fuel saving techniques. COMPATWING ELEVEN is currently participating in this endeavor.

The primary areas of analysis described in this report include: excess fueling; planned vs actual flight time; fuel flow by mission phase; fuel flow by mission type; use of APU for non-operational flights; engine loitered; and number of engines on during taxi. This report contains detailed analysis on fuel consumption during the months of June-August, 1982 for VP squadrons participating in the VP Fuel Conservation Study, (Patrol Squadrons Forty-Nine, Five, Twenty-Four, Fifty-Six and Sixteen).

Background material outlining overall approach and data collection procedures is provided in NADC-81319-20, "VP Fuel Conservation Report (May-October 1981 Data)", 31 December 1981. Quarterly report supplements are provided to update this report. In keeping with the format of previous reports, the supplement starts with section 3.0, Quarterly Data Summary.

Section 3.0, Quarterly Data Summary, details the participating squadrons and the location of these squadrons during the reporting period. Section 4.0, Quarterly Data Analysis, describes each specific area of analysis and contains figures and tables which summarize the five sqadrons' findings combined to reflect a COMPATWING II overview of those squadrons involved in this experiment. Section 5.0 and 6.0 contain Conclusion and Recommendations. Appendicies A through E contain the individual squadron analysis on a per squadron basis. The information in these appendicies is used to support the analysis contained in section 4.0.

Conclusion:

On an average for all missions the squadrons are freighting fuel as follows (K lbs):

Month	June	July	August
Squadron A	5.3	5.9	5.1
B	3.8*	3.0*	2.4*
C	5.6*	6.4*	.7*
D	4.4*	3.1*	5.1
E	6.7	4.5	4.3
Average	5.3	4.3	3.5

* Deployed

The average of planned vs actual flight time for all missions by squadron varies as follows (a negative number means that the flight returned earlier than planned-hrs):

Month	June	July	August
Squadron A	-.8	-.8	-.7
B	.4*	-.5*	-.3*
C	-.5*	-1.8*	-.5*
D	-.6*	-.4*	.1
E	-1.1	-.7	-.4
Average	-.7	-.8	-.4

* Deployed

The projected fuel used by the APU during non-operational (FAM, XCTY, OTHER) pre-flights by each squadron is as follows (K lbs):

Month	June	July	August
Squadron A	56	46	54
B	23*	21*	21*
C	25*	35*	43*
D	13*	46*	4
E	26	39	60
Total	143	187	182

* Deployed

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3.0 QUARTERLY DATA SUMMARY

3.1 FIRST QUARTER DATA SUMMARY

The first reporting period of the VP Fuel Conservation effort commenced in June 1981 with the data from June through August 1981. The squadron involved in the data collection and reporting during this period was PATRON FORTY-NINE (VP-49) stationed at NAS Jacksonville, Florida. During the first quarter, VP-49 completed its pre-deployment preparation at NAS Jacksonville and deployed to Naval Air Facility (NAF) Sigonella, Sicily in mid July 1981. While deployed at NAF Sigonella, VP-49 operated flights from NAF Sigonella, Naples, Rome and Suda Bay. The results of the first quarter data are contained in Reference 1.

3.2 SECOND QUARTER DATA SUMMARY

The second reporting period of the VP Fuel Conservation effort included data from September through October 1981. VP-49 continued to provide the data collection cards during the deployment to NAF Sigonella. PATRON FIVE (VP-5) also joined in the data collection starting in August. VP-5 is located at NAS Jacksonville, Florida and was just returning from a deployment prior to partaking in this effort. Therefore, the majority of the data cards received from VP-5 during the second quarter were from missions originating from NAS Jacksonville. However, some of the flights were from the deployment to NAS Rota, Spain, the Azores and NAS Bermuda. The results of the Second quarter data are contained in Reference 2.

3.3 THIRD QUARTER DATA SUMMARY

The third reporting period of the VP Fuel Conservation effort included data from November 1981 through January 1982. VP-49 and VP-5 continued to provide the data collection cards during the reporting period. VP-49 was on deployment at NAF Sigonella during November and returned to NAS Jacksonville in the middle of December. VP-5 was at NAS Jacksonville the entire reporting period. PATRON TWENTY-FOUR (VP-24) joined the data collection effort in January 1982. VP-24 is currently operating from NAS Jacksonville. The results of the third quarter data are contained in Reference 3.

3.4 FOURTH QUARTER DATA SUMMARY

The fourth reporting period of the VP Fuel Conservation effort included data from February through May 1982. VP-49, 5 and 24 continued to provide the data collection cards during the reporting period. VP-49 and 24 were at NAS Jacksonville the entire reporting period. VP-5 deployed to NAF Sigonella in the middle of May. VP-56, deployed to NAS Bermuda and began data collection in mid February. Additionally, VP-16, located at NAS Jacksonville began data collection in April. The results of the fourth quarter data are contained in Reference 5.

3.5 FIFTH QUARTER DATA SUMMARY

The fifth reporting period of the VP Fuel Conservation effort included data from June through August 1982. The squadrons involved in the data collection and reporting effort during this quarter were VP-49, 5, 24, 56 and 16. VP-5 is currently deployed to NAF Sigonella and VP-24 deployed to NAS Rota in June 1982. VP-56 returned from deployment to NAS Bermuda in July 1982 and is currently assigned to NAS Jacksonville along with VP-49 and 16.

A comparison of the total number of flights by month and squadron, made available from the yellow sheets, and the number of usable data base cards is contained in Table 3-1. This reveals that 66% of all flights are completing and submitting the Fuel Mission Summary Form.

NOTE: The number of flights represents the number of yellow sheet flights and the number of data cards are those which were submitted by the flight crews with sufficient completeness that yield useful data. Also in most tables the number of samples is generally less than the number of data cards turned in for that period. This is due to the fact that the data needed to make the calculation was not entered on the data card.

SQUADRON	JUNE			JULY			AUGUST			TOTAL		
	FLTS	CARDS	%	FLTS	CARDS	%	FLTS	CARDS	%	FLTS	CARDS	%
A	119	106	89.1	85	80	94.1	104	88	85	308	274	89
B	124*	93	75.0	146*	121	82.9	131*	100	76	401	314	78
C	97*	70	72.2	85*	58	68.2	134*	28	21	316	156	49
D	117*	51	43.6	126*	35	27.8	65*	12	18	308	98	32
E	114	105	92.1	82	57	69.5	115	80	70	311	242	78
TOTAL	571	425	74.4	524	351	67.0	549	308	56	1644	1084	66

* Deployed

Table 3-1 TOTAL FLIGHTS VS FLIGHT CARDS RECEIVED

4.0 QUARTERLY DATA ANALYSIS

During this reporting period (June through August 1982) the analysis continued to be performed in the areas of excess fuel on board the aircraft, actual versus planned flight time, and fuel flow as a function of both mission phase and mission type. Additionally, analysis of the use of Auxiliary Power Units (APU) versus Ground Support Equipment (GSE) on non-operational (FAM, XCTY, OTHER) flights; engines loitered on station, and engine mode during taxi out has been performed.

The seven areas of analysis and their relationship to fuel conservation are summarized as follows:

- Excess fueling - to demonstrate the direct relationship between the aircraft weight and fuel flow that exists (e.g., the heavier the aircraft, the higher the fuel flow).
- Planned versus actual flight time - to determine if the aircraft are being overfueled for the planned flight times or if the planned flight times are in excess of required time and therefore resulting in excess fuel loading.
- Mission type fuel flow - to determine if fuel flow is a function of mission type.
- Mission phase fuel flow - to determine if aircrews are adjusting and modifying procedures during mission phases which will result in a decrease of fuel usage.
- APU vs. GSE - to determine the potential savings gained by utilizing GSE on all non-operational (FAM, XCTY, OTHER) flights.
- Engine loiter - to determine to what extent aircrews are loitering engines.
- Engines on during taxi - to demonstrate potential savings of fuel consumption by utilizing two-engine taxi to the runway.

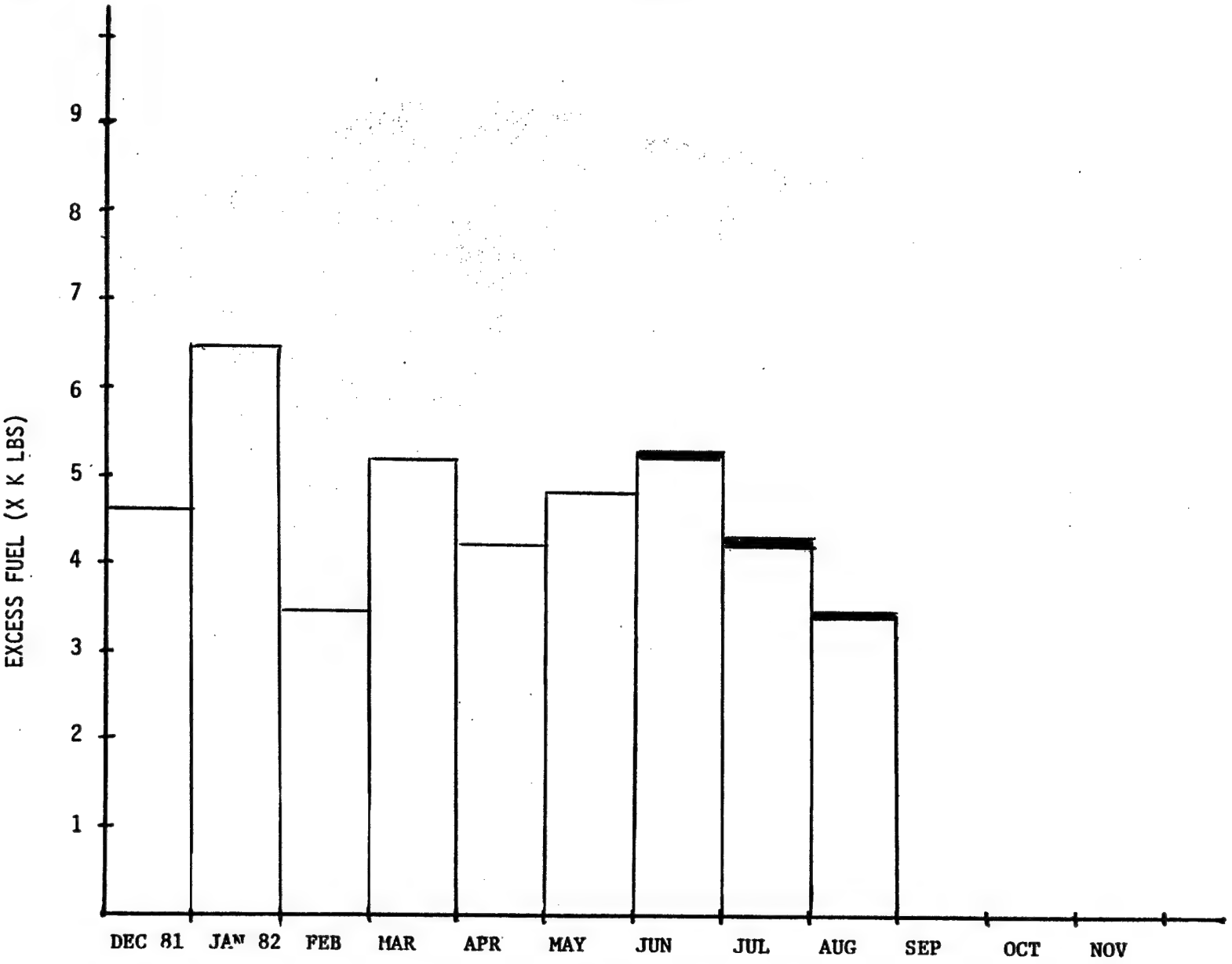
The remainder of this section discusses the analysis of these seven areas.

4.1 EXCESS FUEL

There are several ways to look at excess fuel loads. An overview at the combined squadron level is shown in Figure 4-1 and supported by Table 4-1. This figure demonstrates the combined squadrons mean excess fuel at engine shutdown on a per flight per month basis. These values were obtained as follows (it should be noted that carrying extra fuel results in an increased aircraft gross weight and increased fuel consumption):

MONTH	AVERAGE EXCESS FUEL (lbs)	STANDARD DEVIATION	SAMPLE SIZE	AVERAGE FLIGHT TIME DEVIATION (hrs)	STANDARD DEVIATION	SAMPLE SIZE
DEC 81	4640	500	57	-.6	0	57
JAN 82	6400	2200	128	-.6	.2	135
FEB	3400	1000	163	-.4	0	163
MAR	5100	1700	157	-.4	.5	157
APR	4200	1000	282	-.4	.1	254
MAY	4800	1800	221	-.5	.2	239
JUN	5300	1100	373	-.7	.3	390
JUL	4300	1400	293	-.8	.5	309
AUG	3500	1500	266	-.4	.2	289
SEP						
OCT						
NOV						

Table 4-1 AVERAGE EXCESS FUEL AT LANDING AND PLANNED VS ACTUAL FLIGHT TIME VARIATION COMBINED SQUADRONS



NOTE: The heavy lines (JUN-AUG) signify the quarter being analyzed.

Figure 4-1 AVERAGE EXCESS FUEL AT LANDING
COMBINED SQUADRONS

- Obtain fuel remaining at engine start and at engine shutdown.
- Determine fuel used for each data collection card by subtracting the fuel remaining at engine shutdown from the fuel remaining at engine start.
- Add the specific on top fuel requirements for each of the bases to the fuel used and use this value as the "adjusted fuel load".
- Determine the excess fuel load by subtracting the adjusted fuel load from the fuel remaining at engine shutdown.
- Determine the mean value of the excess fuel loaded for each of the individual squadrons per month.
- Determine the mean value of the excess fuel loaded for all squadrons combined per month and plot on Figure 4-1. Figure 4-1 and Table 4-1 are supported by the data contained in Table 1 and Figure 1 of Appendices A through E.

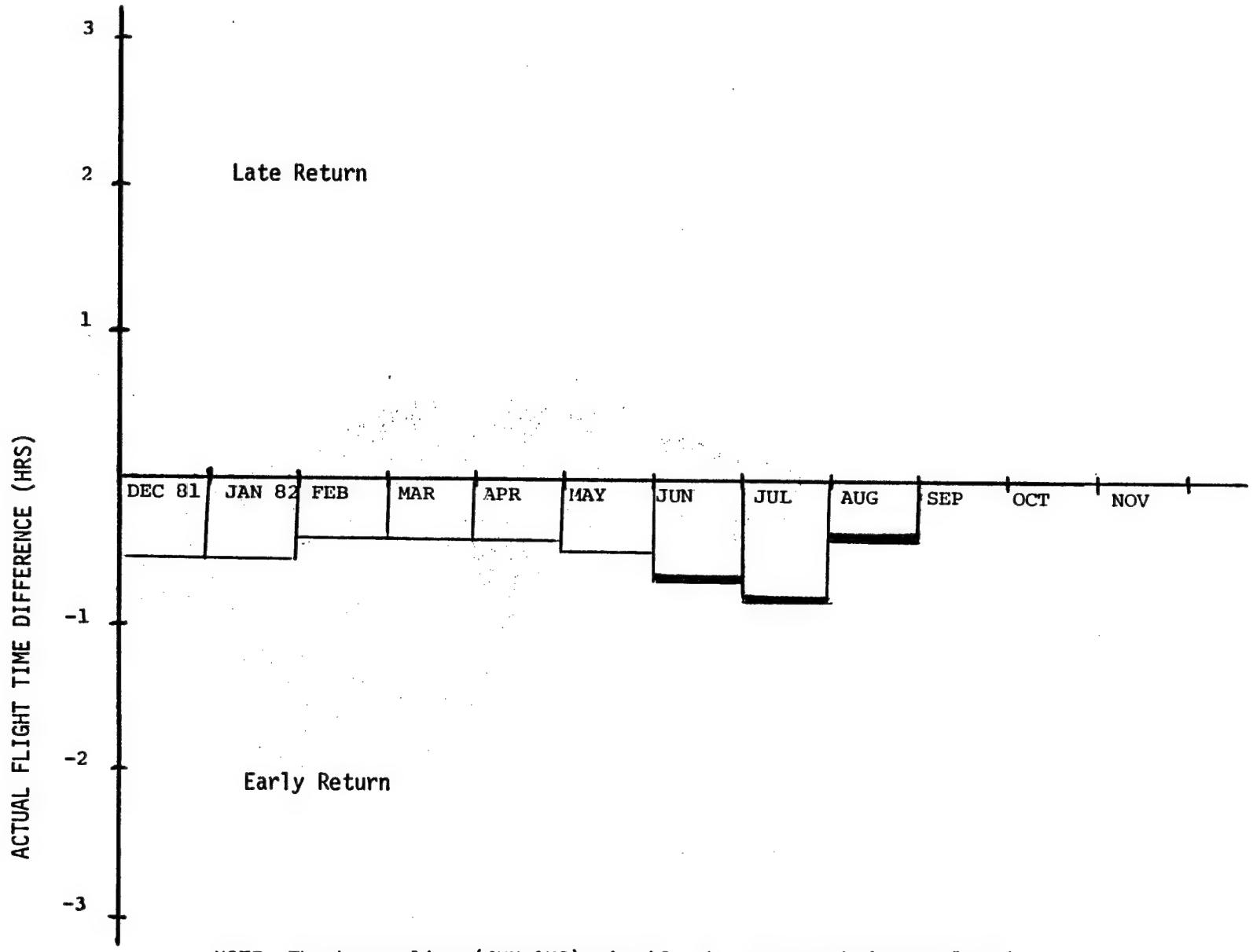
It is important to note flights that returned earlier than scheduled (due to aborts or cancellations), fueled for PLE, were extended or flights which were intermediate stops on cross countries in which the aircraft initial fuel load was for the final destination were not included in this analysis, provided the data collection cards were annotated accordingly. Also, it is possible to obtain an approximation of the excess fuel being carried on the flights by multiplying the monthly excess fuel value by the sample size for that month.

A second way to examine fuel freighting is to sort the data into expected flight duration and analyze the fuel freighting problem as a function of the expected flight duration. This approach is presented to each of the participating squadrons in the monthly reports and is contained in each of the appendices as Figure 3, 4 and 5 of Appendices A through E. Displays are for this quarterly reporting period.

4.2 PLANNED VS ACTUAL FLIGHT TIME

Analysis of planned vs actual flight time was performed by extracting the entry contained in the Expected Flight Hours data element (card 2 columns 25-27) and comparing that with the actual flight times. Actual flight time was determined as the difference between the take-off time entry (card 3 columns 1-4) and land time entry (card 6 columns 1-4). All flight data cards that recorded comments reflecting extended flights or aborted flights were eliminated from this analysis.

Figure 4-2 depicts the average difference between planned and actual flight time for all participating squadrons combined. Table 4-1 contains the values, standard deviation and sample size. Figure 4-2 is supported by Table 1 and Figure 2, 6, 7 and 8 of Appendices A through E. Displays are for this quarterly reporting period.



NOTE: The heavy lines(JUN-AUG) signify the quarter being analyzed.

Figure 4-2 AVERAGE FLIGHT TIME DEVIATION PLANNED VS ACTUAL FLIGHT TIME COMBINED SQUADRONS

As can be observed in Figure 4-2 all squadrons involved in the VP Fuel conservation effort are flying (on the average) less than the planned time. It must be noted however, that a few flights have been returning 4-5 hours prior to scheduled time and these flights may be influencing the findings (refer to specific figures in Appendices A through E). Since no comments are included on the data cards, these flights must be used in the analysis.

4.3 FUEL FLOW

Table 4-2 and Figure 4-3 depict the fuel flow for all mission phases and squadrons combined, by mission type per month. Table 4-3 and Figure 4-4 depict the fuel flow, for all mission types and squadrons combined, by mission phase per month. As mentioned earlier, fuel flow is being investigated to determine variation within mission types and mission phases, to observe trends regarding aircrew involvement, and to see where conservative measurements are being applied. The values contained in Table 4-2 and depicted in Figure 4-3 are obtained by dividing the duration from take-off to land into the fuel consumed during the duration. These values are obtained from OVERALL diplay 4 "Summary By Pilot" (Ref. 2). Table 3 and Figure 9 in Appendicies A through E provide individual squadron summaries of fuel flow by mission type and were used to support Table 4-2 and Figure 4-3.

The fuel flow by mission phase values contained in Table 4-3 and Figure 4-4 are obtained by dividing the duration of each mission phase into the fuel consumed during the specific mission phase. These values are obtained from the OVERALL display 1 "Fuel Consumed by Stage of Flight" (Ref. 2). Table 3 and Figure 10 in each of the Appendices A through E provide individual squadron summaries of fuel flow by mission phase and were used to support Table 4-3 and Figure 4-4.

4.4 APU VS GSE DURING PREFLIGHT

COMPATWING ELEVEN Fuel Conservation Conference, Report of 3 April 1981 OPS Memo 7-81 (Ref. 4), proposed a series of 43 fuel conservative measures which could result in the reduction of fuel consumption. Two such proposed measures, #2 and #5, were concerned with the use of GSE as opposed to APU during preflights for non-operational flights. Table 4-4 and Figure 4-5 were developed utilizing the data received during this reporting period and demonstrate the potential fuel savings available by utilizing GSE on all non-operational (FAM, XCTY, OTHER) flights. These tables and figures were developed utilizing the following considerations: an APU burns fuel at a rate of 300 lb/hr. GSE is utilized only on non-operational flight; GSE would be available for all non-operational flight; the ratio of operational to non-operational flights obtained from the data cards received is viable for projection to total flights (yellow sheets); and those non-operational flights using GSE are not included.

	FUEL FLOW - SAMPLE SIZE MISSION TYPE					
MONTH	ASW	SS	DS	FAM	XCTY	OTHER
DEC 81	4035/31	4226/2	3092/2	3493/8	3830/37	4294/12
JAN 82	4168/32	4107/5	4084/4	4350/33	3823/64	4179/23
FEB	4179/57	4196/9	4162/2	4129/31	3911/56	4170/51
MAR	4148/68	4367/8	3819/4	4183/69	3883/69	4476/38
APR	4105/74	4544/10	4208/9	4731/72	4104/96	4138/72
MAY	4346/108	4337/13	-	4250/45	4112/99	4360/96
JUN	4271/149	4185/11	4317/4	4115/63	3887/97	4350/76
JUL	4198/117	4212/12	4846/1	4023/39	4407/96	4054/54
AUG	4094/114	4280/9	4290/1	3962/58	4055/79	3978/41
SEP						
OCT						
NOV						

Table 4-2 FUEL FLOW BY MISSION PHASE COMBINED SQUADRONS

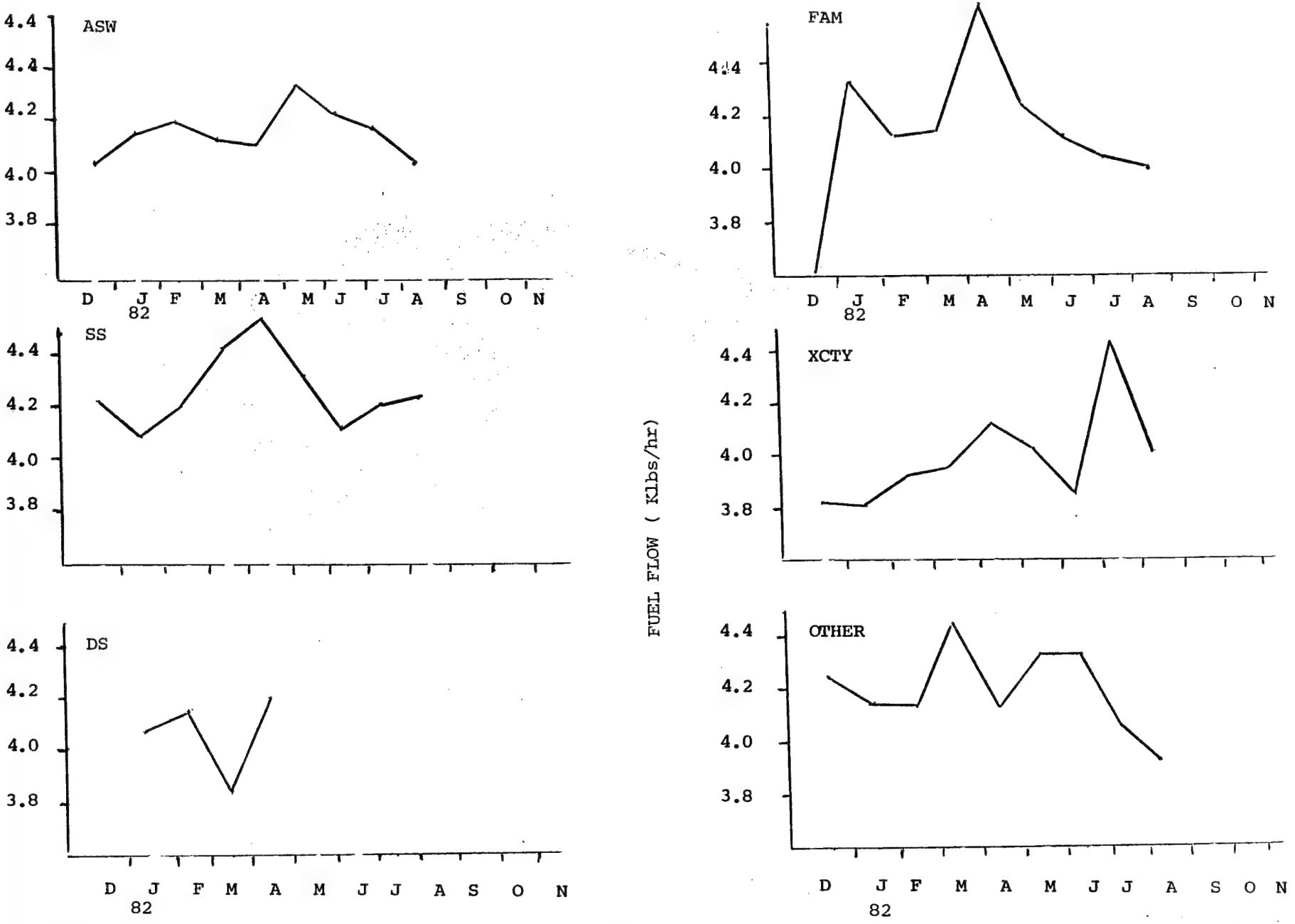
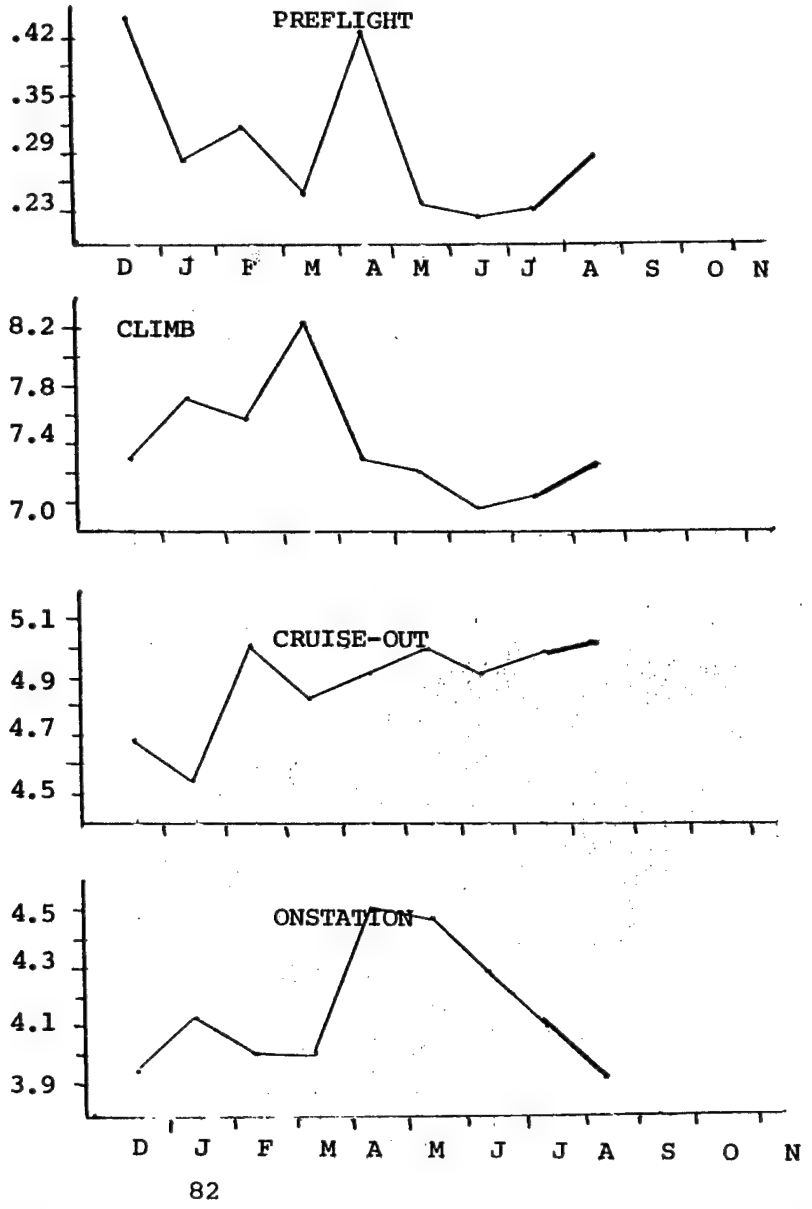
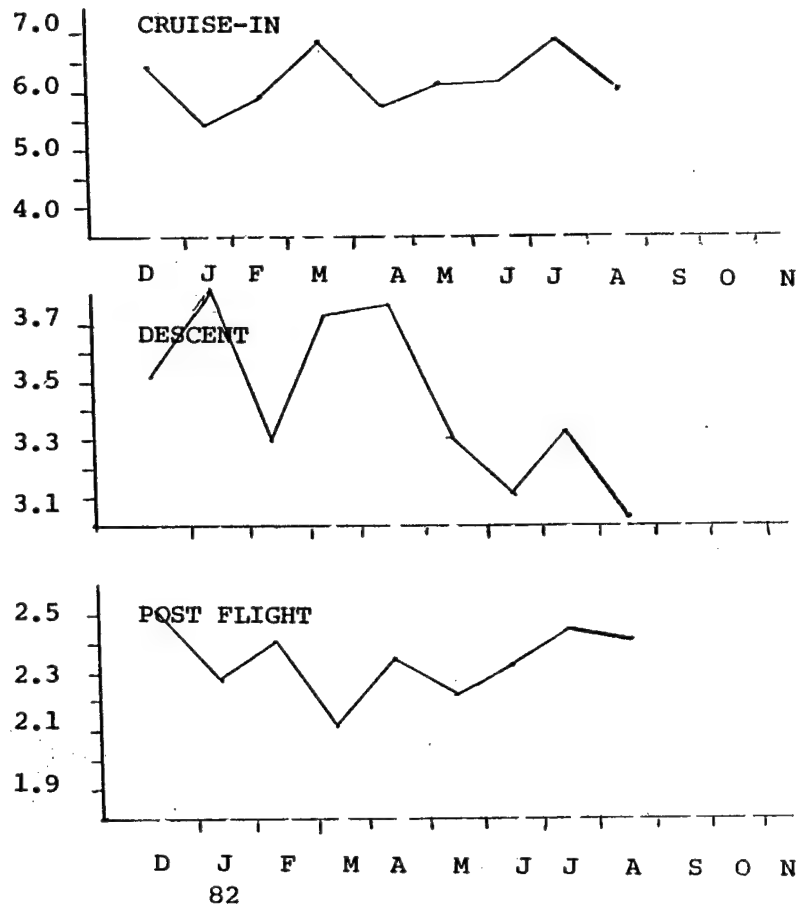


FIGURE 4-3 FUEL FLOW BY MISSION TYPE - COMBINED SQUADRONS

MONTH	FUEL FLOW - SAMPLE SIZE						
	PREFLIGHT	CLIMB	CRUISE OUT	ONSTATION	CRUISE IN	DESCENT	POST FLIGHT
DEC 81	446-73	7267-78	4696-56	3958-38	6403-14	3565-63	2515-62
JAN 82	285-114	7799-125	4556-59	4142-46	5550-2	3845-108	2298-115
FEB	320-871	7622-184	5070-113	4011-89	5917-21	3385-149	2417-160
MAR	259-233	8213-207	4821-134	4034-98	6705-14	3776-165	2134-191
APR	394-139	7282-263	4924-181	4514-117	5715-20	3769-212	2364-248
MAY	241-264	7188-296	5086-211	4510-140	6126-40	3348-204	2228-292
JUN	330-261	6908-316	4908-243	4322-182	6168-34	3120-241	2337-315
JUL	240-230	6964-256	4971-185	4139-154	6876-25	3366-214	2442-263
AUG	336-229	7262-225	5098-165	3977-120	5907-34	2973-174	2406-213
SEP							
OCT							
NOV							

Table 4-3 FUEL FLOW BY MISSION PHASE COMBINED SQUADRONS





FUEL FLOW (Klbs/hr)

FIGURE 4-4 FUEL FLOW BY MISSION PHASE - COMBINED SQUADRONS

Table 4-4 depicts the projected amount of fuel used per month by squadron for the non-operational preflights. These amounts do not include those non-operational flights which did use GSE, as well as those non-operational flights which would have been projected to use GSE for preflights. Each squadron's fuel use by month was based on the projected number of non operational preflights using APU multiplied by the average non-operational preflight duration multiplied by 300 lbs./hr. Figure 4-5 is a graphic depiction of the total fuel used by APU by all the squadrons during non-operational preflights. Table 4 and Figure 11 an 12 of Appendices A through E provide individual squadron summaries of APU usage and were used to support Table 4-4 and Figure 4-5.

Two issues which must be addressed in the APU vs GSE preflight analysis are the availability of operable GSE and the cost to operate the GSE. GSE is assumed to be available and fully operable for this analysis. In fact this is not always true, which results in the high usage of APU for non-operational flights. However, the projected cost savings may warrant an investigation into obtaining more GSE. This analysis also assumes that the squadrons are not responsible for supplying fuel for the GSE. Again this may not be a totally correct assumption.

4.5 ENGINE LOITER

Proposed fuel conservation measures numbers 27 and 28 of reference 4 pertain to maximizing the loitering of engines while performing highwork. Table 4-5 and Figure 4-6 demonstrate the combined squadrons adherence to these proposed conservation measures. These tables and Figures show that the majority of the flights will shut down at least one engine for a portion of the operational flight. However, there appears to be somewhat of a reluctance at loitering two engines. What is not determined from this analysis is the number of flights which could have loitered two engines but did not. The data required to perform this analysis is not currently available.

Table 4-5 and Figure 4-6 are supported by Table 5 and Figure 13 in Appendicies A through E. These tables and figures graphically depict the number of engines loitered while on station by the individual squadrons.

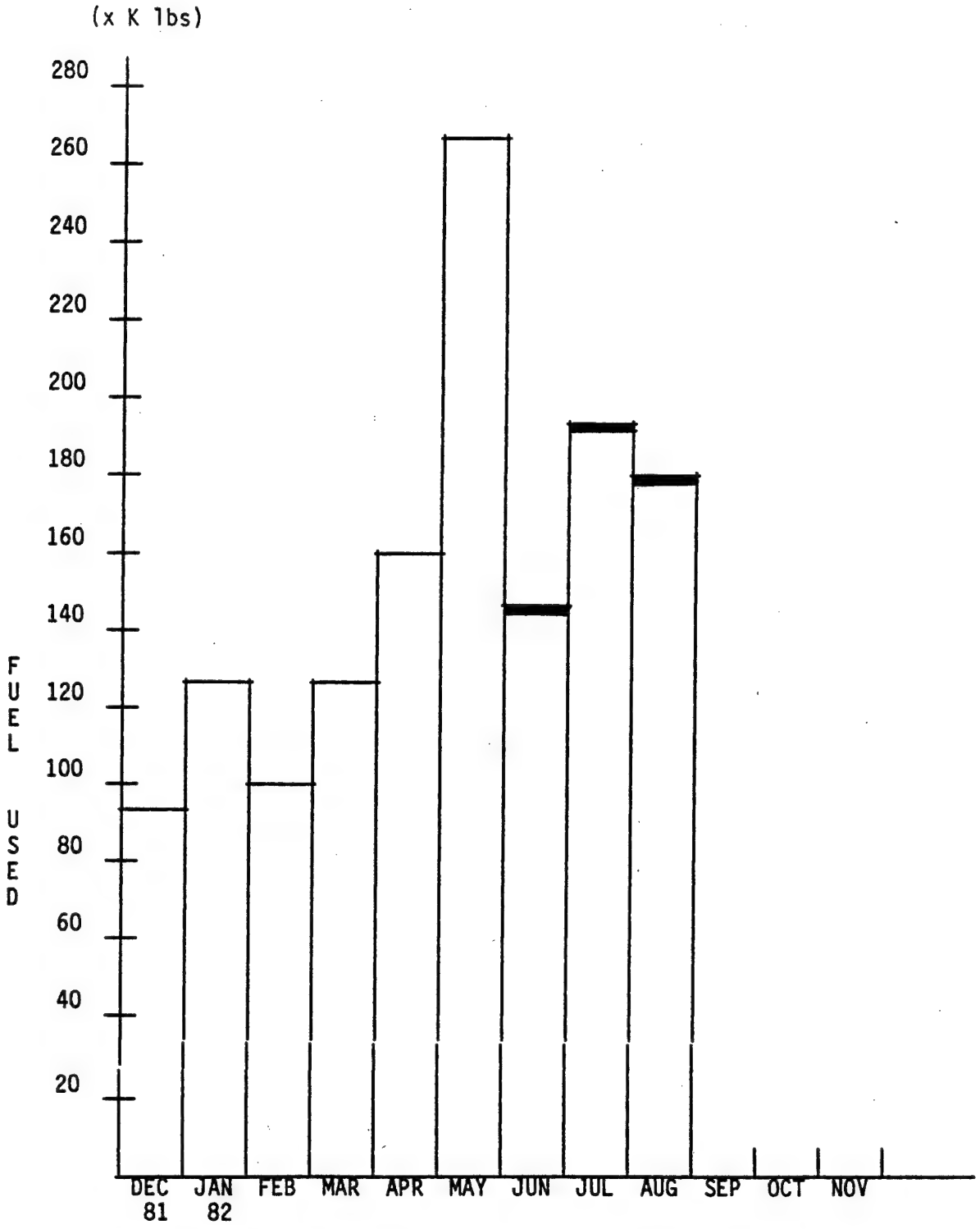
4.6 ENGINE MODE DURING TAXI

Investigation into the manner in which flight crews operated the engines during taxi for take-off reveals that fuel consumption could be reduced by stricter adherence to the two engine taxi proposed fuel conservation measure (Reference 5). This analysis does not take into account environmental factors such as snow and ice, however all the squadrons analyzed have been operating from bases where those environmental factors are of no major significance (NAS Jacksonville, NAS Bermuda and NAF Sigonella, NAS Rota). Table 4-6 and Figure 4-7 depict by squadron the percentage of flights that have been taxying with 2, 3 and 4 engines operating. Table 4-6 and Figure 4-7 are supported by Table 6 and Figure 14 in Appendices A through E. These tables and figures graphically depict the number of engines on prior to taxi for the individual squadron.

	FUEL USED (lbs)					
MONTH	SQUADRON A	SQUADRON B	SQUADRON C	SQUADRON D	SQUADRON E	TOTAL
DEC 81	47,790*	48,000	xx	xx	xx	95,790
JAN 82	52,200	53,940	19,950	xx	xx	126,090
FEB	28,840	36,750	29,160	13,400*	xx	108,190
MAR	44,640	27,000	34,560	19,860*	xx	126,000
APR	33,840	30,000	52,440	32,760*	14,280	163,320
MAY	35,880	50,400*	69,770*	63,270*	52,260	271,580
JUN	56,070	22,680*	25,200*	12,600*	26,520	143,070
JUL	46,020	20,520*	34,560*	46,500*	39,000	186,600
AUG	54,000	20,060*	42,900*	4,080	60,000	182,080
SEP						
OCT						
NOV						

* Deployed
xx Not yet in experiment

Table 4-4 PROJECTED NON OP APU FUEL USED DURING PREFLIGHT COMBINED SQUADRONS



NOTE: The heavy lines (JUN-AUG) signify the quarter being analyzed.

Figure 4-5 PROJECTED NON OP APU FUEL USED DURING PREFLIGHT COMBINED SQUADRONS

MONTH	NUMBER OF OCCURRENCES OF ENGINE LOITER (OFF) BY SQUADRON															COMBINED					
	A			B			C			D			E			NUMBER			PERCENTAGE		
	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2
DEC 81	6	12	8*	3	11	1		xx			xx			xx		9	23	9	22	56	22
JAN 82	5	4	0	5	21	2	3	7	1		xx			xx		13	32	3	27	67	6
FEB	4	11	5	2	15	4	4	17	10	7	14	1*		xx		17	57	20	18	61	21
MAR	3	11	1	6	28	1	5	18	12	3	11	4*		xx		17	68	18	17	67	17
APR	8	15	0	6	14	0	9	21	3	11	29	11*	1	17	0	35	96	14	24	66	10
MAY	4	15	4	1	16	1*	21	16	5*	9	24	5*	3	25	1	38	96	16	25	64	11
JUN	4	12	3	0	33	32*	15	18	3*	9	25	13*	2	25	13	30	113	56	15	57	28
JUL	4	12	1	2	45	31*	2	11	1*	5	20	0*	1	12	0	14	100	33	10	68	22
AUG	3	13	0	0	30	27*	1	11	0*	1	1	0*	0	19	1	5	74	20	5	69	26
SEP																					
OCT																					
NOV																					

* Deployed
xx Not yet in experiment

Table 4-5 ON STATION ENGINE LOITER (OFF) COMBINED SQUADRONS

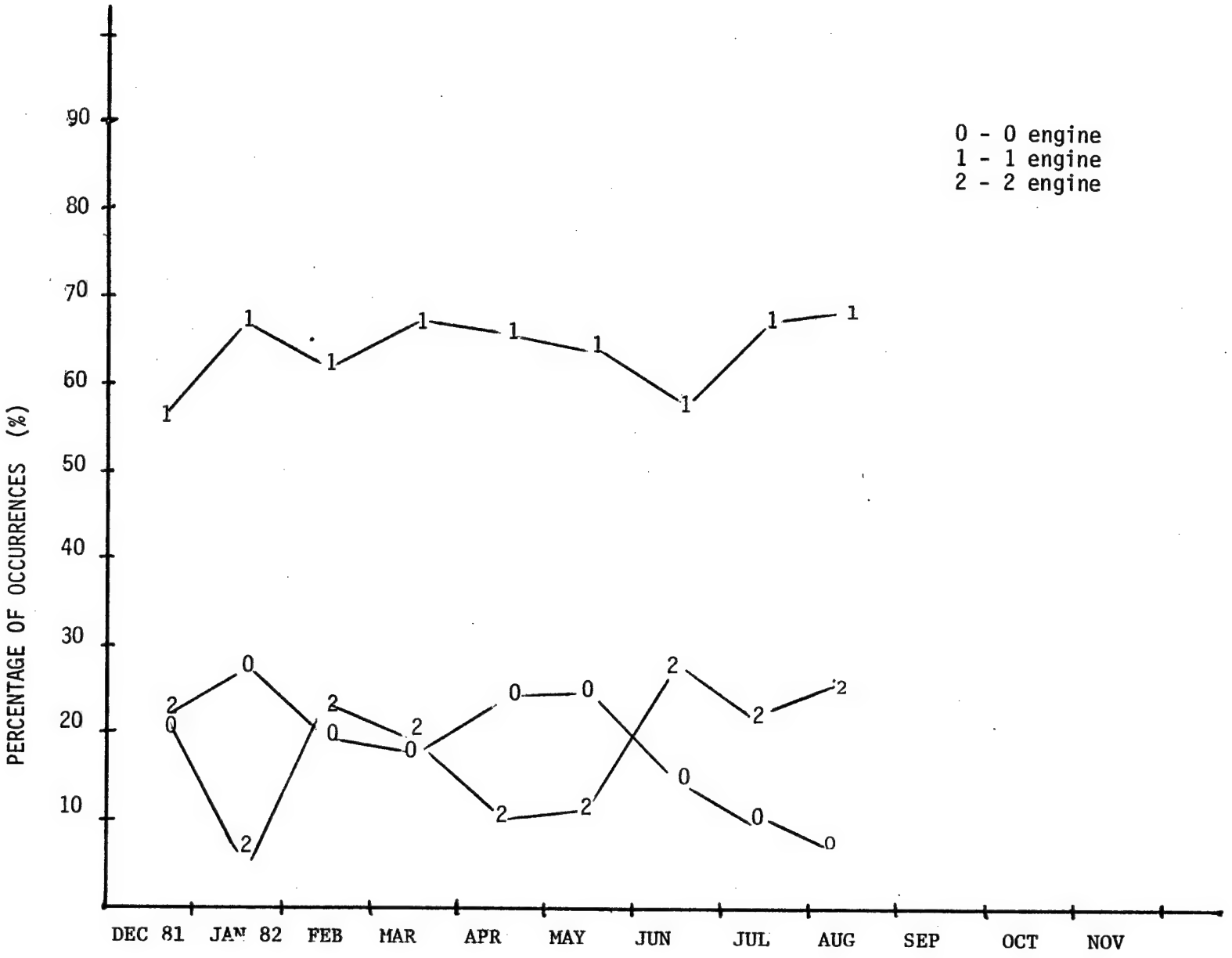


Figure 4-6 ON STATION ENGINE LOITER (OFF)
COMBINED SQUADRONS

MONTH	NUMBER OF OCCURRENCES OF ENGINE ON BY SQUADRON															COMBINED					
	A			B			C			D			E			PERCENTAGE			NUMBER		
	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
DEC 81	30	0	24*	5	0	21		xx			xx			xx		44	0	56	35	0	45
JAN 82	24	3	17	12	3	47	25	4	5		xx			xx		43	7	50	61	10	71
FEB	27	0	15	19	1	26	54	11	5	20	1	1*		xx		67	7	26	120	13	47
MAR	36	0	27	18	2	38	72	4	11	15	1	6*		xx		61	3	36	141	7	82
APR	33	3	13	17	0	31	77	7	6	34	6	21*	1	1	41	58	6	36	166	7	102
MAY	40	0	14	17	2	32*	71	3	7*	33	4	16*	11	2	54	56	4	40	173	11	123
JUN	54	4	19	36	9	37*	53	2	2*	32	3	13*	14	3	72	54	6	40	182	21	143
JUL	45	7	10	54	3	53*	37	2	4*	17	3	14*	20	1	29	58	5	37	173	16	110
AUG	41	11	20	51	2	34*	21	0	0*	5	1	6	23	1	43	55	6	39	141	15	103
SEP																					
OCT																					
NOV																					

* Deployed
xx Not yet in experiment

Table 4-6 ENGINES ON PRIOR TO TAXI COMBINED SQUADRONS

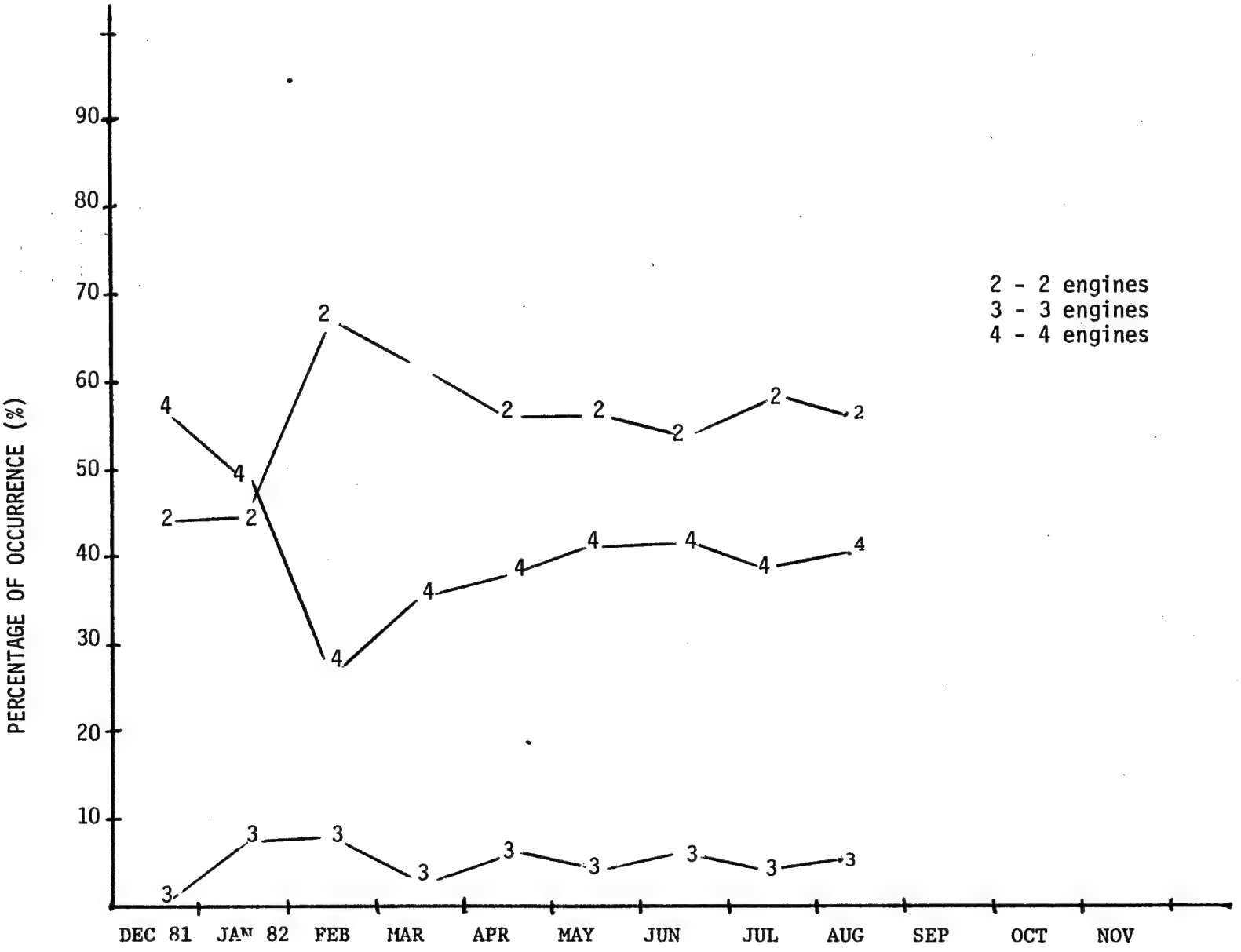


Figure 4-7 ENGINES ON PRIOR TO TAXI
COMBINED SQUADRONS

5.0 CONCLUSIONS

1. The assistance of participating squadron and COMPATWING-11 personnel continues to be exceptional, however some fall off in cards being submitted has occurred.

2. Fuel Freighting (Figure 4-1 and Figures 3, 5 and 7 of Appendices A through E) still appears to be a problem area and causing high fuel consumption. No consistent trends of reduction of excess fuel loads have been established. The following summarizes the average excessive freighted fuel (lbs) per flight per squadron over this reporting period.

SQUADRON	JUN	JUL	AUG
A	5300	5900	5100
B	3800	3000	2400
C	5600	6400	700
D	4400	3100	5100
E	6700	4500	4300

3. As reported in previous Quarterly Reports, the greater portion of flights which carry excess fuel appears to still be those flights of 5 hour planned flight time or less. Probable causes of this excess fueling include excessive ramp load requirements, scheduling flights (primarily training) for larger duration than needed, potential airborne maintenance problems on aircraft assigned training missions, and fueling multiple stop cross-countries with fuel for final destination and not refueling at intermediate stops.

4. Utilization of GSE during preflight of all non-operational flights (FAM, XCTY, OTHER) could result in a substantial amount of fuel savings as depicted in Table 4-4 and Figure 4-5. This analysis assumes adequate availability of GSE.

5. Aircrews are realizing the fuel savings potential gained by flying 3 engine loiter as depicted by percentage of operational flights that do shut down at least one engine while on station. (Table 4-5 and Figure 4-6).

6. Fuel savings potentials obtained by taxi on two engines can be improved as depicted in Table 4-6 and Figure 4-7. More fuel can be saved, and a resultant decrease in cost per flight hour, by crews who use two engine taxi.

7. Squadrons are continuing to show a higher fuel flow during cruise-in as compared to cruise-out (Table 4-3 and Figure 4-4).

6.0 RECOMMENDATIONS

1. All participants in the VP Fuel Conservation Experiment should be commended for their diligence and willingness to partake in the experiment. The quality of data cards has generally improved for all squadrons during this reporting period. The continuous interest shown by these participants demonstrates a concern for fuel conservation and their interest to evaluate their own proficiency.

2. A detailed investigation of time required to perform various training evolutions, standard ramp loads, aircraft availability and cross-country fuel loading requirements should be conducted to reduce the fuel freighting and actual vs. planned flight time deviation variations.

3. Maximize the use of GSE for all non-operational preflights and investigate at the WING and base level the potential for obtaining and maintaining adequate GSE to support non-operational flights.

4. Re-emphasize at the squadron level the utilization of 2 engine loiter while on station weather and time permitting.

5. Stress the fuel savings attainable by maximizing two engine taxi to the runway when weather and operational constraints permit.

6. Cruise-in fuel flow reduction may be accomplished by proper altitude and speed selections.

REFERENCES

1. NAVAIRDEVCEN Technical Memorandum 31-81, "VP Fuel Conservation Quarterly Repot (June-August 1981), D. Bellis, G. Katz, A. McCarty, 30 September 1981.

2. NAVAIRDEVCEN Report No. NADC-81319-20, "Vp Fuel Conservation Report (May-October 1981 Data), D. Bellis, G. Katz, A. McCarty, Interim Report, 31 December 1981.

3. NAVAIRDEVCEN Technical Memorandum 9-82, "VP Fuel Conservation Quarterly Report (November 1981-January 1982) Supplement", G. Katz, A. McCarty, 30 March 1982.

4. COMPATWING ELEVEN OPSMEMO 7-81, "Fuel Conservation Conference, Report Of", 03 April 1981. (Reprinted in Reference 2 as appendix B).

5. NAVAIRDEVCEN Technical Memorandum SD-10-82 "VP Fuel Conservation Quarterly Report (February-May 1982) Supplement", A. McCarty, 30 June 1982.

APPENDIX A

SQUADRON A FUEL USAGE BREAKDOWN

MONTH	AVERAGE EXCESS FUEL (lbs)	STANDARD DEVIATION	SAMPLE SIZE	AVERAGE FLIGHT TIME DEVIATION (hrs)	STANDARD DEVIATION	SAMPLE SIZE
DEC 81 *	4600	6000	35	-.6	0.9	55
JAN 82	3900	3100	38	-.7	2.3	45
FEB	5200	3600	48	-.4	1.3	48
MAR	5500	5600	50	-.7	1.4	50
APR	4800	4700	63	-.5	1.0	63
MAY	6200	4600	43	-.8	1.2	43
JUN	5300	4270	82	-.8	1.4	90
JUL	5900	7600	56	-1.0	1.8	61
AUG	5100	6100	69	-.7	2.1	76
SEP						
OCT						
NOV 82						

* Deployed

TABLE A-1 AVERAGE EXCESS FUEL AT LANDING AND PLANNED VS. ACTUAL FLIGHT TIME DEVIATION - SQUADRON A

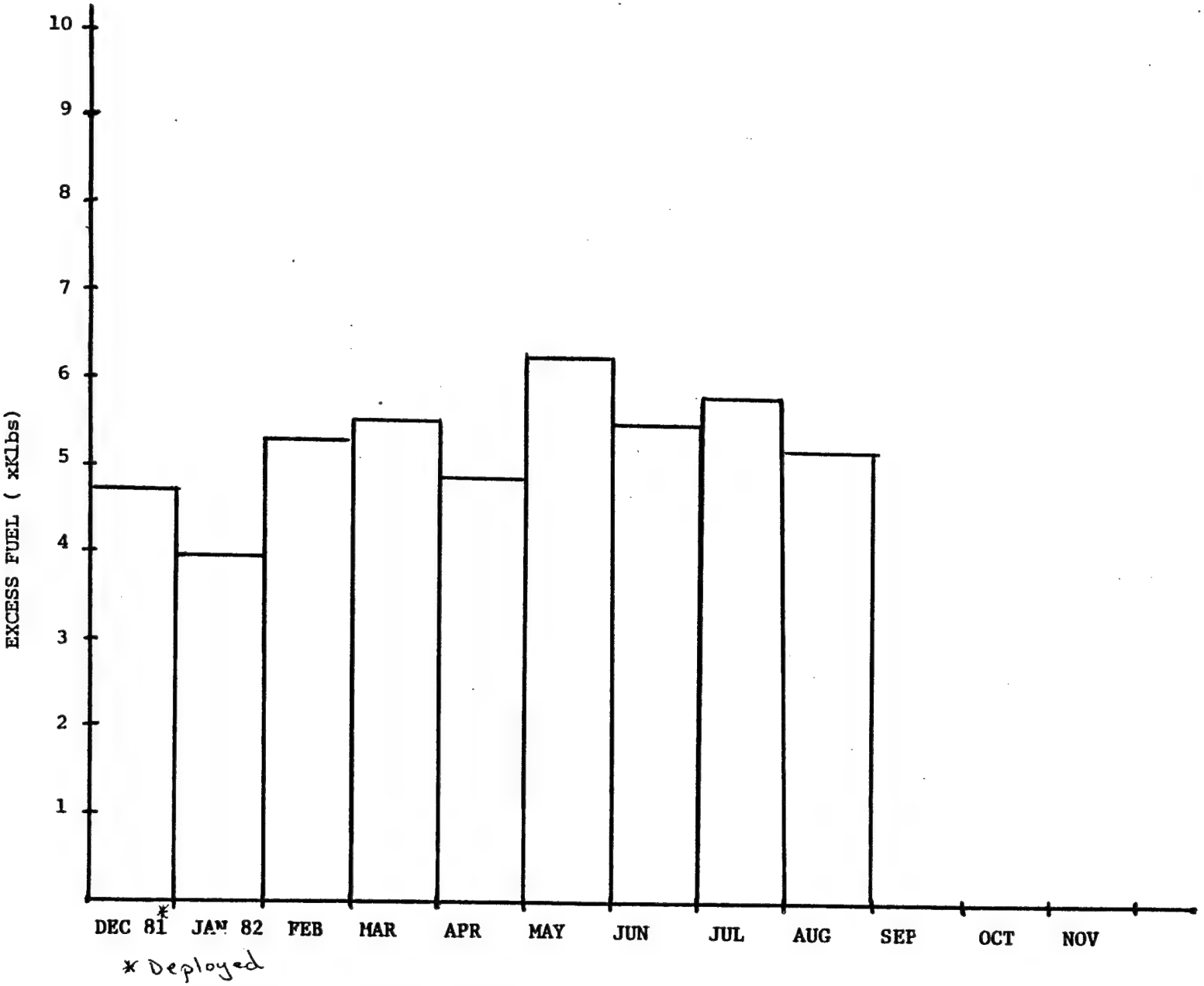


FIGURE A-1 AVERAGE EXCESS FUEL AT LANDING - SQUADRON A

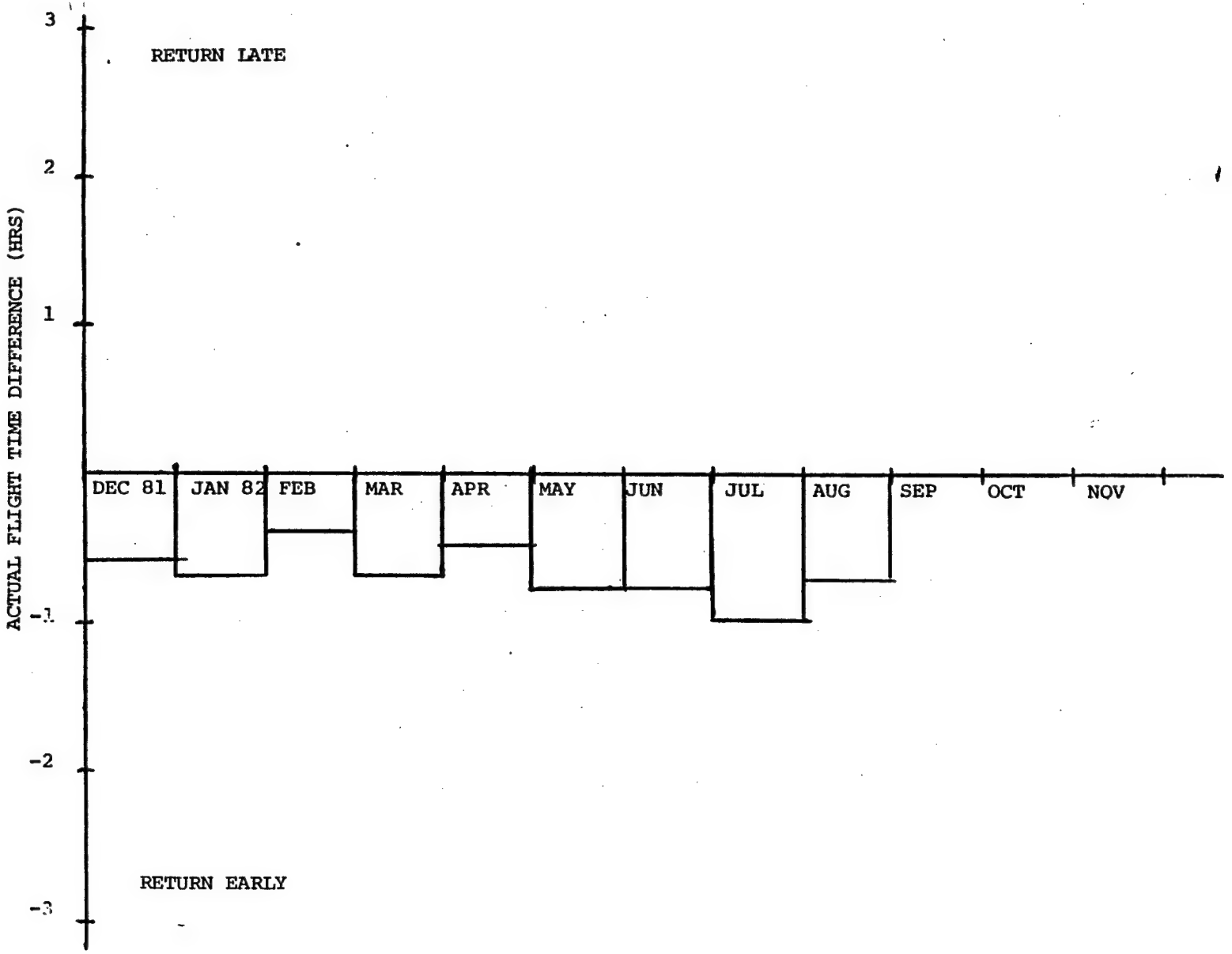


FIGURE A-2 AVERAGE FLIGHT TIME DEVIATION PLANNED VS. ACTUAL FLIGHT TIME - SQUADRON A

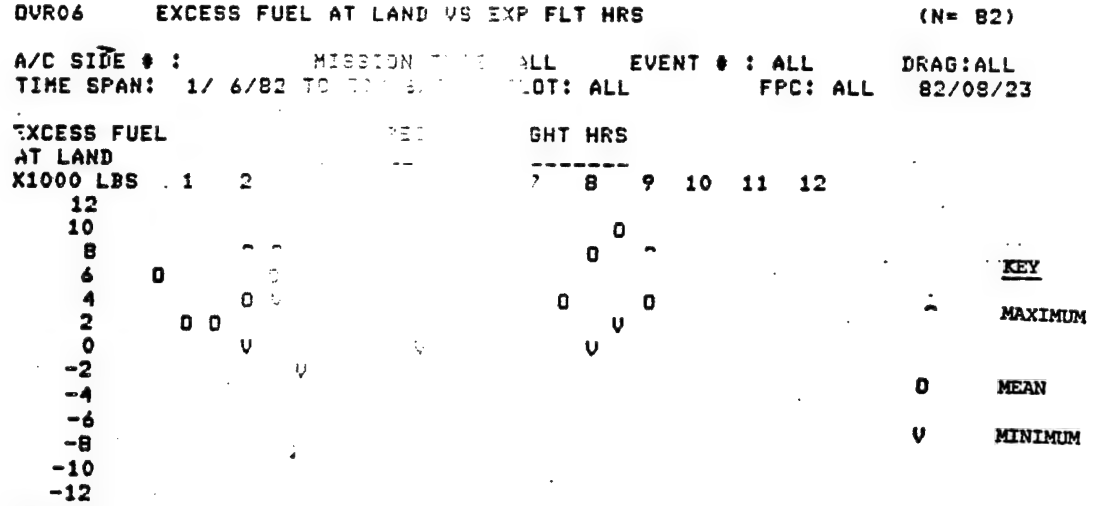


FIGURE A-3 EXCESS LANDING JUNE - SQUADRON A

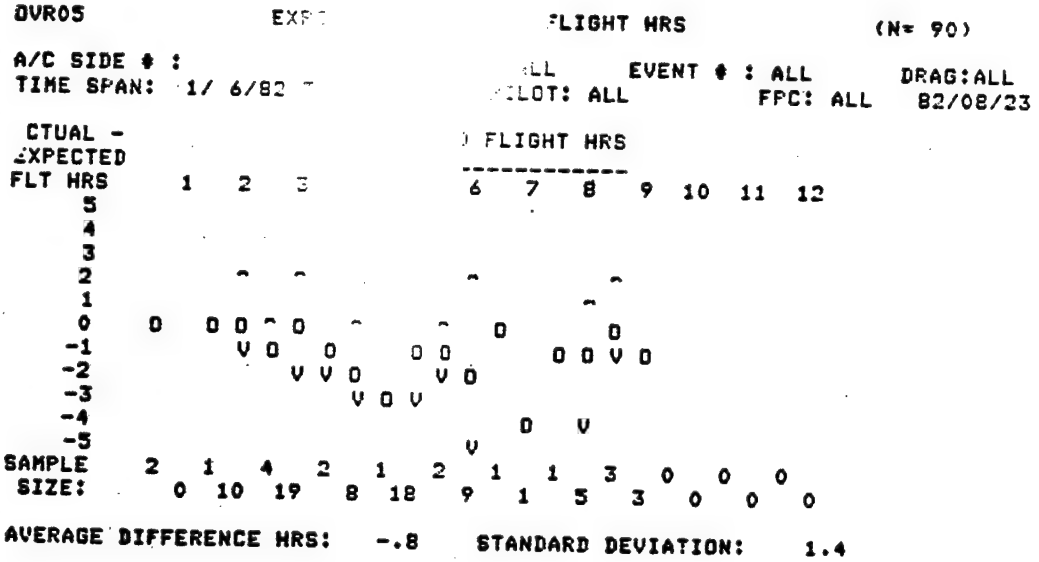


FIGURE A-4 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JUNE - SQUADRON A

```
OVR06     EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 56)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 31/ 7/82  PILOT: ALL          FPC: ALL   82/09/15

 XCESS FUEL              EXPECTED FLIGHT HRS
AT LAND                  ------------------
X1000 LBS    1   2   3   4   5   6   7   8   9  10  11  12
    12        0 0                   0               0
    10    0                       ^       ^   0       ^
     8                            0
     6            0                   V ^   ^ V
     4    V         ^ ^             V     0   0
     2        V   V 0 0   0 0                0           0
     0            V   V                      V
    -2              V
    -4
    -6
    -8                                       V           V 0
   -10
   -12
SAMPLE    0   0   1   3   0   1   0   4   3   0   0   1
 SIZE:      4   3   7   4   5   6   2   5   3   1   3   0

AVERAGE EXCESS FUEL:   5977.     STANDARD DEVIATION:    7649.
```

FIGURE A-5 EXCESS FUEL AT LANDING JULY - SQUADRON A

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 61)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 31/ 7/82  PILOT: ALL          FPC: ALL   82/09/15

 CTUAL -                 EXPECTED FLIGHT HRS
 XPECTED                 ------------------
FLT HRS      1   2   3   4   5   6   7   8   9  10  11  12
     5
     4
     3
     2                        ^
     1    ^       ^ ^ ^       ^
     0    0   ^ 0       0   0           ^ ^ ^           ^ 0
    -1        0   0 0       V 0 0   ^ 0   0 ^   ^
    -2        V   V V V                   0 V 0
    -3                            V   0               0
    -4                                    V   0
    -5                                    V
SAMPLE    0   0   1   4   0   1   0   5   2   0   0   1
 SIZE:      4   5   7   5   5   6   3   4   3   2   3   0

AVERAGE DIFFERENCE HRS:  -1.0    STANDARD DEVIATION:    1.8
```

FIGURE A-6 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JULY - SQUADRON A

```
OVR06     EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 69)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL   82/09/22

 'CESS FUEL              EXPECTED FLIGHT HRS
  . LAND                 --------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12    0                     ^               0
    10            ^   ^                   0
     8                0                     V
     6      0   ^              0 0
     4              0                ^ 0   ^ 0 ^       0
     2          0       0           0     0   0
     0                      V   V   V   V     V
    -2          V
    -4
    -6
  : -8                                                  0
   -10              V                             0
   -12
SAMPLE    1   0   0   1   1   2   0   1   3   1   0   1
 SIZE:      2   7  13   8  13   5   2   3   4   1   0   0

AVERAGE EXCESS FUEL:   5101.     STANDARD DEVIATION:    6126.
```

FIGURE A-7 EXCESS FUEL AT LANDING AUGUST - SQUADRON A

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 76)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL   82/09/22

 'TUAL -                 EXPECTED FLIGHT HRS
 .PECTED                 --------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4
     3
     2                          ^
     1          ^     0 ^ 0       0                   ^
     0    0 0   0   0             ^       0   0 ^
    -1          V         0   0 0 V   V 0 V   ^   0
    -2              V
    -3                    V                   0
  : -4                        V                   0
  : -5                                                V
SAMPLE    1   0   0   1   1   3   0   1   3   0   0   0
 SIZE:      2   7  15   9  14   6   2   4   4   3   0   0

AVERAGE DIFFERENCE HRS:   -.7    STANDARD DEVIATION:    2.1
```

FIGURE A-8 ACTUAL VS. PLANNED FLIGHT TIME VARIATION AUGUST - SQUADRON A

MONTH	ASW		SS		DS		FAM		XCTY		OTHER	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81 *	4035	22	4226	1	—	0	3493	3	3830	30	4294	7
JAN 82	4164	6	4011	2	—	0	4375	20	3502	19	4194	6
FEB	4061	15	4105	3	4165	1	3848	11	3364	13	3839	9
MAR	3826	12	4236	3	—	0	4117	26	2690	18	4204	9
APR	3882	14	4269	1	—	0	4128	20	3381	15	4378	5
MAY	4107	17	4428	6	—	0	4174	16	2869	17	4211	9
JUN	4149	18	4328	2	—	0	4021	14	3717	55	4189	13
JUL	4319	17	4313	2	—	0	4264	7	4550	38	4248	11
AUG	4224	15	4266	5	—	0	4228	21	4312	32	4409	12
SEP												
OCT												
NOV 82												

* Deployed

TABLE A-2 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON A

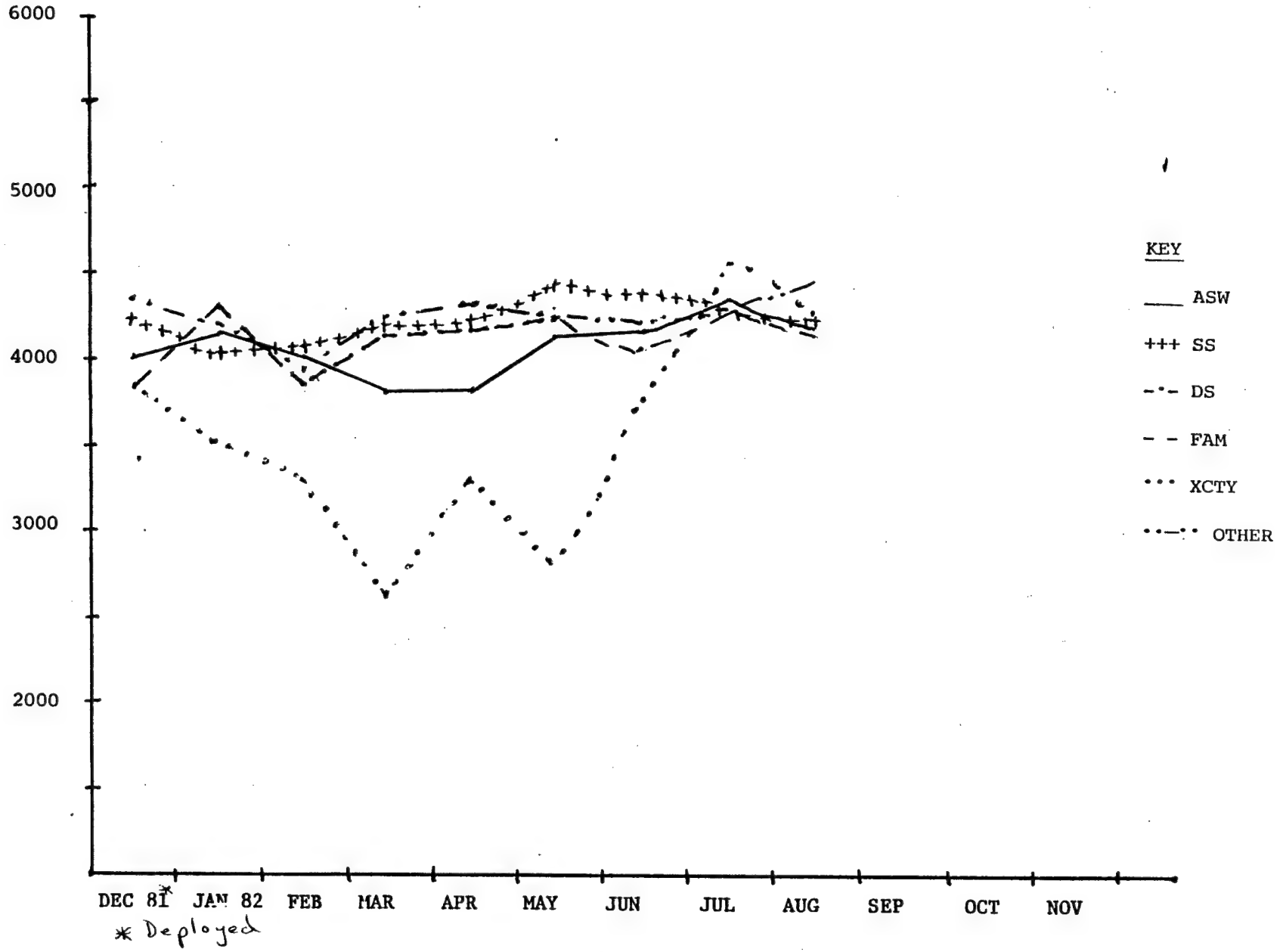


FIGURE A-9 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE – SQUADRON A

MONTH	PREFLIGHT		CLIMB		CRUISE-OUT		ONSTATION		CRUISE-IN		DESCENT		POSTFLIGHT	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81 *	242	48	7038	54	4829	33	3882	24	6827	9	3660	46	2719	41
JAN 82	228	41	8989	27	4465	12	3747	9	5550	2	3258	26	2763	39
FEB	276	47	7456	40	5171	21	3774	19	5480	3	3435	28	2770	42
MAR	188	52	8526	45	5430	24	3836	15	—	0	3736	34	2130	50
APR	162	43	7766	44	4587	33	4080	19	6060	4	4191	35	2148	46
MAY	250	50	6649	45	4760	27	3974	21	5237	7	3240	30	2056	55
JUN	188	67	5943	89	3958	36	4143	19	8580	2	3421	62	2133	70
JUL	169	51	6873	57	4806	30	4070	23	9072	5	3310	50	2633	46
AUG	477	62	7405	67	5332	30	4094	21	5316	5	3096	53	2819	72
SEP														
OCT														
NOV 82														

* Deployed

TABLE A-3 AVERAGE FUEL FLOW BY MISSION PHASE - SQUADRON A

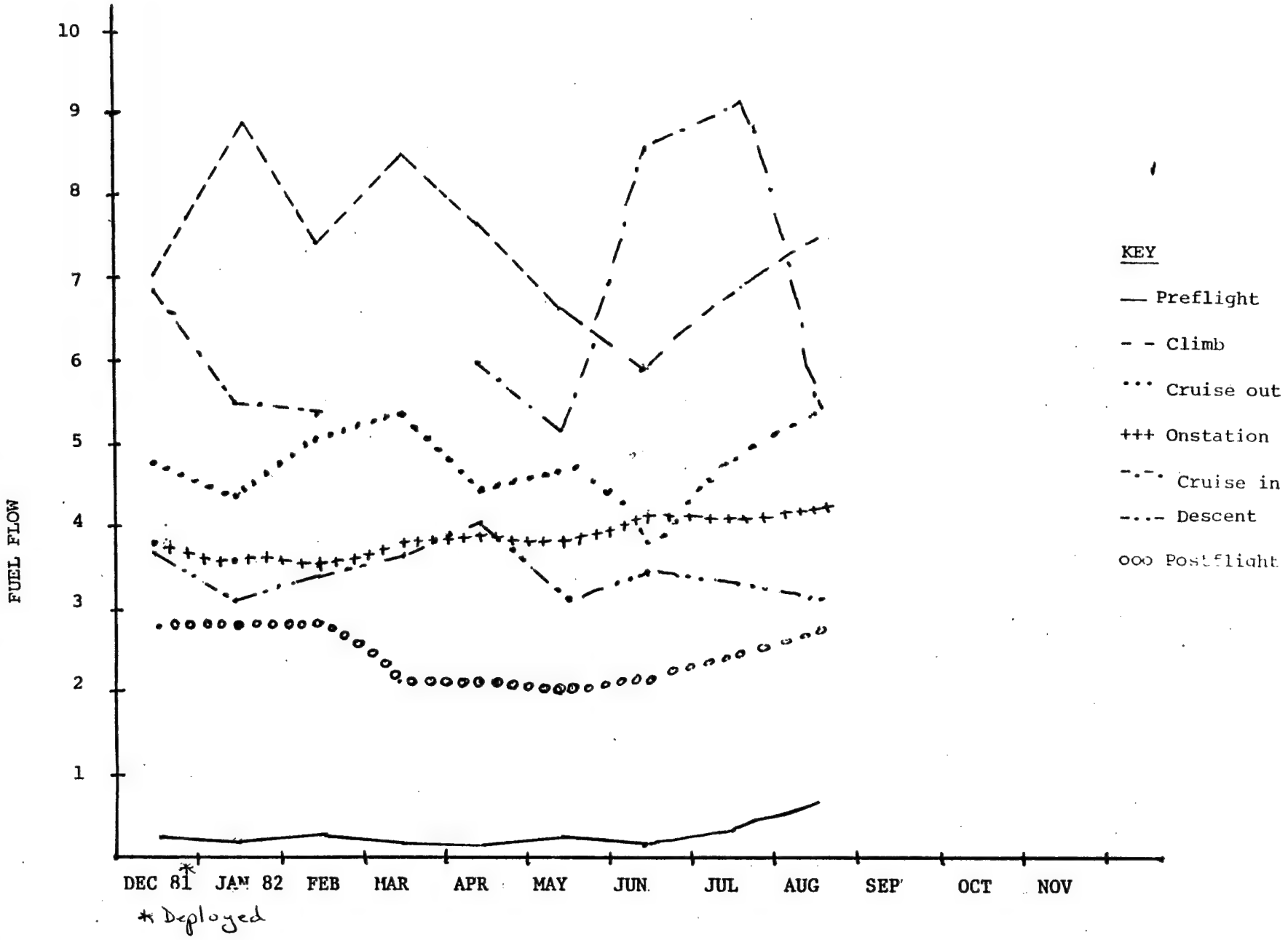


FIGURE A-10 --FUEL FLOW BY MISSION P[illegible] SQUADRON A

MONTH	TOTAL FLIGHTS	% FLIGHTS NON OP	% FLIGHTS NON OP GSE USED	AVER NON OP P/F(hr)	PROJECTED NON OP FUEL (lbs)	AVER OP P/F (hrs)	PROJECTED OP FUEL (lbs)	TOTAL P/F FUEL (lbs)
DEC 81 *	98	64	7	2.7	47,790	2.7	28,350	76,140
JAN82	75	87	8	2.9	52,200	3.2	9,600	61,800
FEB	67	58	7	2.3	28,840	2.7	25,110	49,950
MAR	93	75	12	2.4	44,640	2.9	20,010	64,650
APR	83	72	23	2.4	33,840	2.8	19,320	53,160
MAY	90	65	12	2.3	35,880	3.0	34,200	70,080
JUN	119	81	8	2.1	56,070	3.0	20,700	76,770
JUL	85	70	2	2.6	46,020	3.0	19,800	65,820
AUG	104	76	9	2.5	54,000	2.8	21,000	75,000
SEP								
OCT								
NOV 82								

* Deployed

TABLE A-4 PROJECTED APU FUEL USED DURING PREFLIGHT (lbs) SQUADRON-A

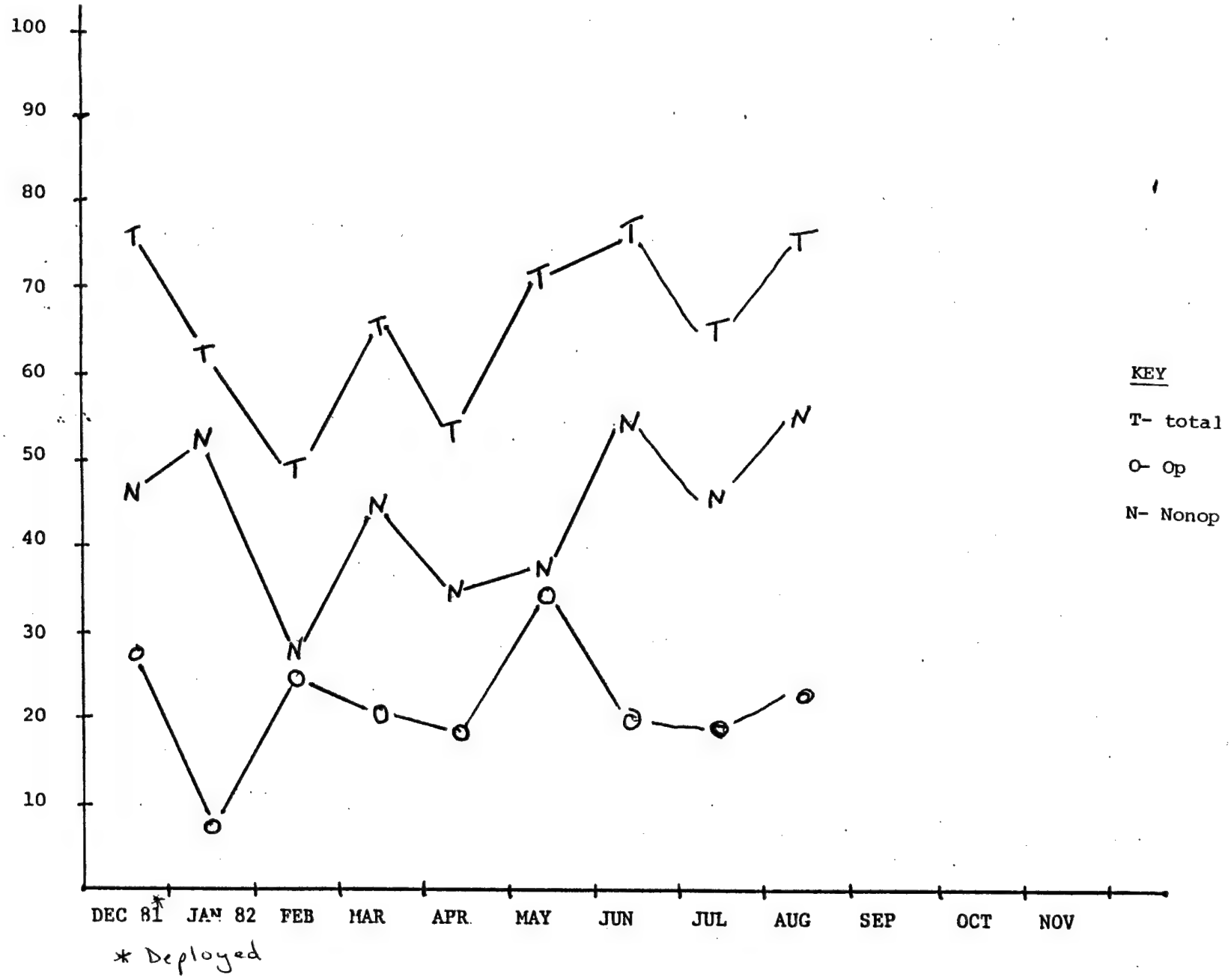


FIGURE A-11 PROJECTED APU FU USED DURING PREFLIGHT-SQUADRON A

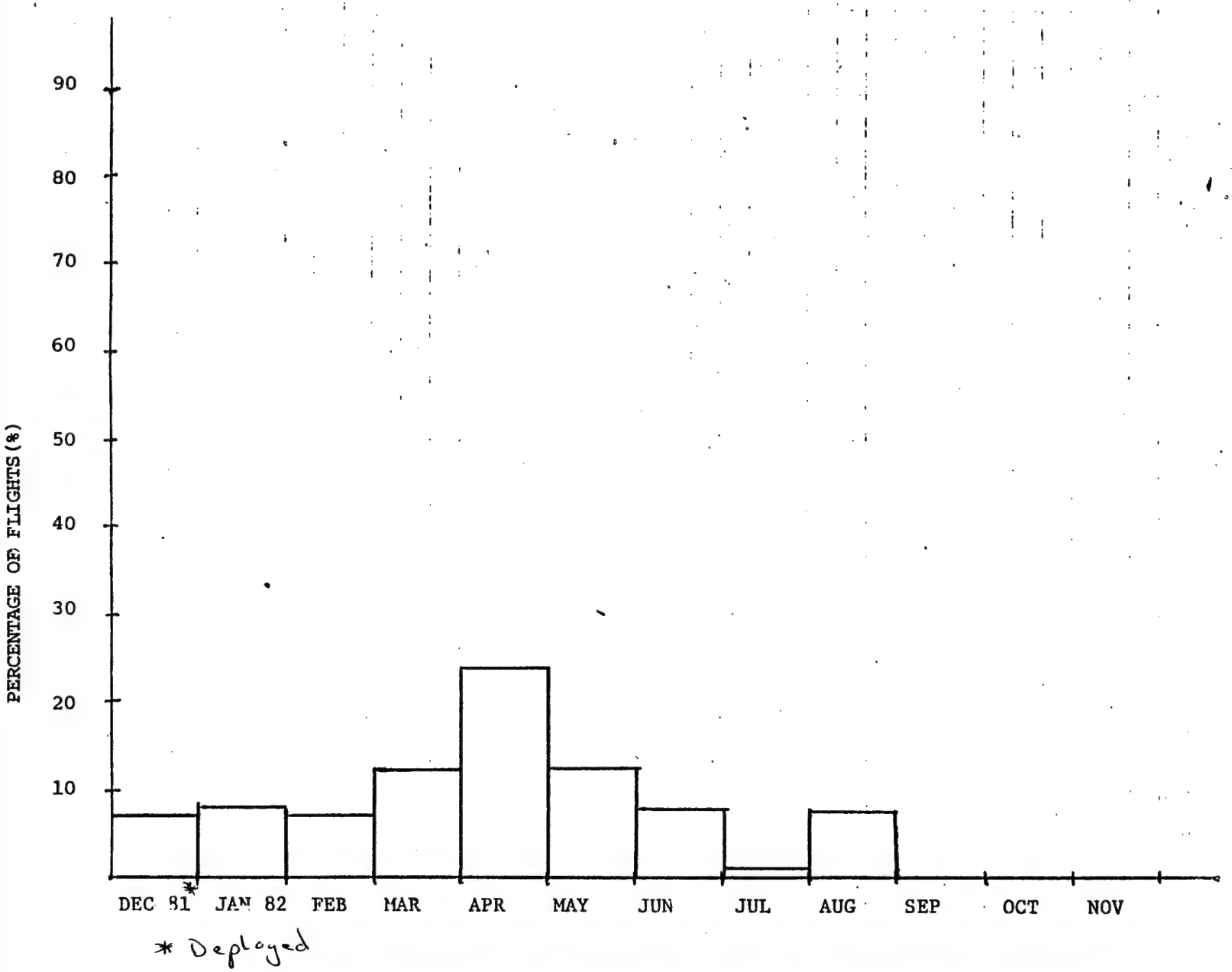


FIGURE A-12 PERCENT OF NON OP FLIGHTS USING GSE AT PREFLIGHT - SQUADRON A

MONTH	0 ENGINES LOITERED		1 ENGINE LOITERED		2 ENGINES LOITERED	
	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES
DEC 81 *	23	6	46	12	31	8
JAN 82	56	5	44	4	0	0
FEB	20	4	55	11	25	5
MAR	20	3	73	11	7	1
APR	35	8	65	15	0	0
MAY	17	4	65	15	17	4
JUN	21	4	63	12	16	3
JUL	24	4	71	12	6	1
AUG	19	3	81	13	0	0
SEP						
OCT						
NOV 82						

* Deployed

TABLE A-5 PERCENTAGE AND NUMBER OF OCCURANCES OF 0,1 and 2 ENGINE LOITERED ONSTATION (OPERATIONAL FLIGHTS) – SQUADRON A

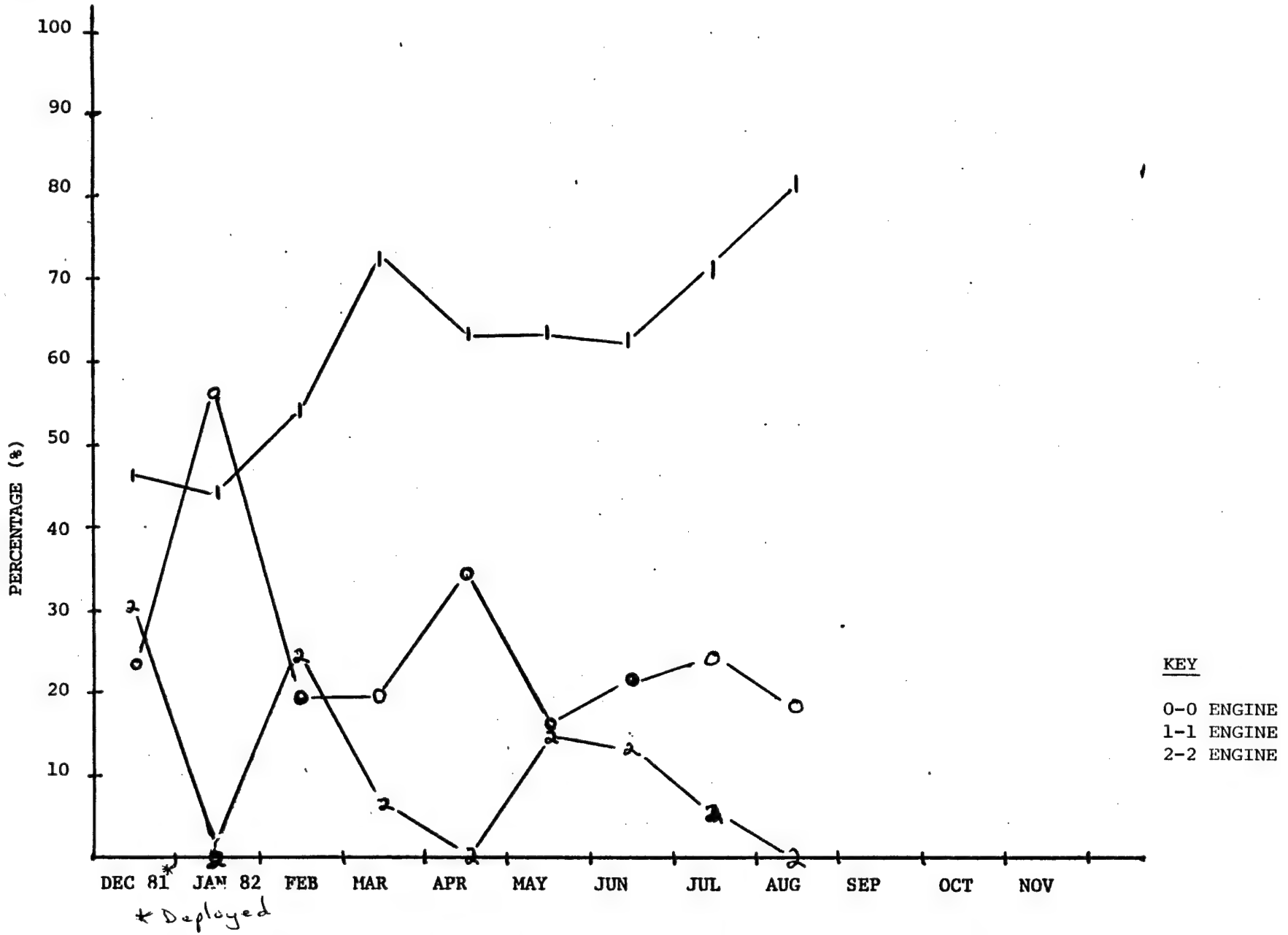


FIGURE A-13 ONSTATION ENGINE LOITER PERCENTAGE (OPERATIONAL FLIGHTS - SQUADRON A)

MONTH	TOTAL FLIGHTS (YELLOW SHEET)	AVERAGE TAXI TIME (min)	ENGINES ON PRIOR TO TAXI (%)			PROJECTED FUEL (lbs)		
			2 ENG	3 ENG	4 ENG	TAXI 2+3+4 ENGINE	TAXI 2 ENGINE	SAVINGS
DEC 81*	98	13	56	0	44			
JAN 82	75	12	55	7	39			
FEB	83	12	64	0	36			
MAR	93	14	60	0	40			
APR	83	12	57	0	43			
MAY	90	12	74	0	26			
JUN	119	11	70	5	25			
JUL	85	12	73	11	16			
AUG	104	11	57	15	28			
SEP								
OCT								
NOV 82								

PROJECTED FUEL CONSUMED DURING TAXI NOT CALCULATED

* Deployed

TABLE A-6 PROJECTED FUEL USED DURING TAXI - SQUADRON A

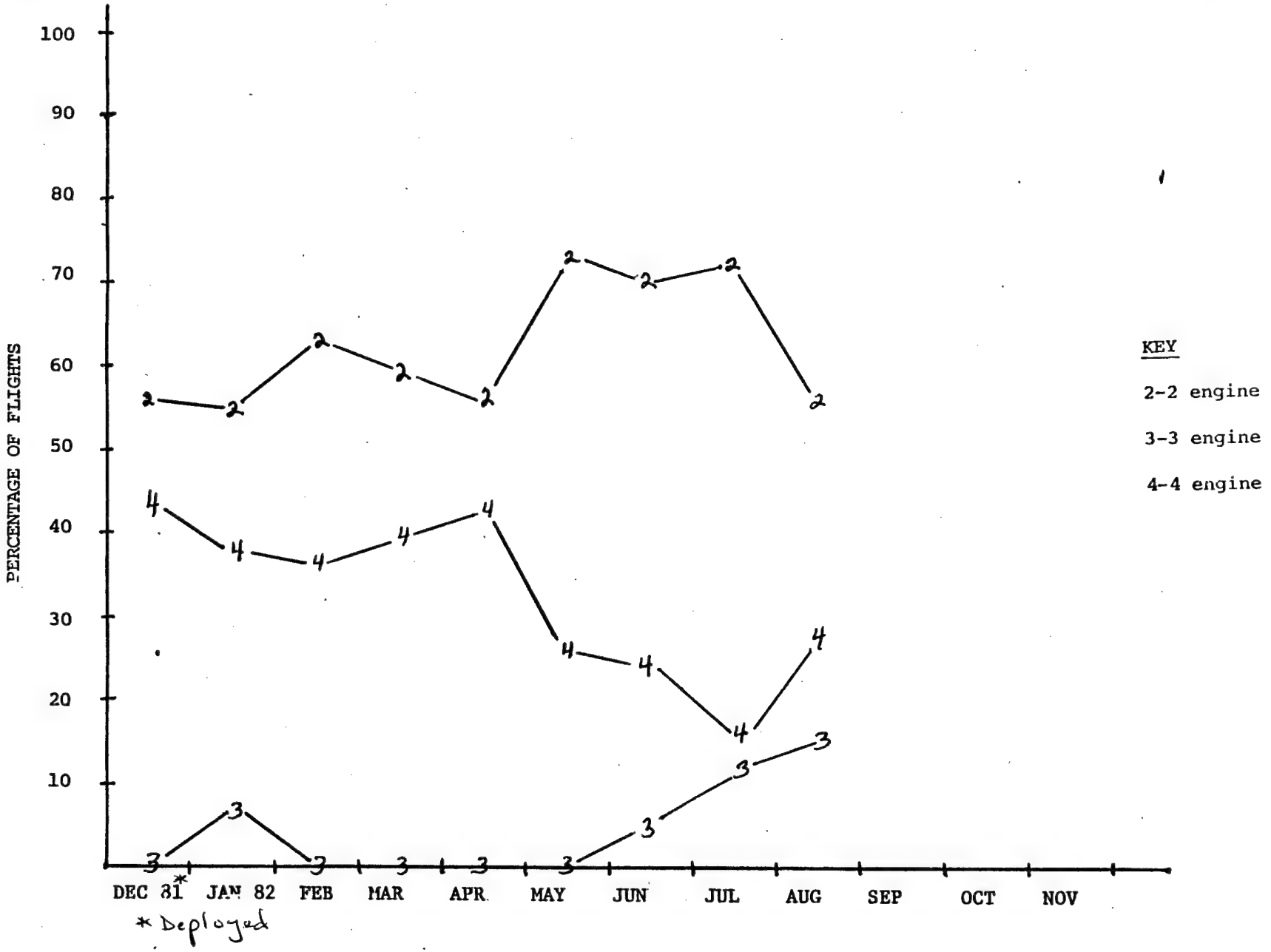


FIGURE A-14 ENGINES ON PRIOR TO TAXI – SQUADRON A

APPENDIX B

SQUADRON B FUEL USAGE BREAKDOWN

MONTH	AVERAGE EXCESS FUEL (lbs)	STANDARD DEVIATION	SAMPLE SIZE	AVERAGE FLIGHT TIME DEVIATION (hrs)	STANDARD DEVIATION	SAMPLE SIZE
DEC 81	4700	5800	22	-.6	1.2	22
JAN 82	8800	6900	56	-.4	2.2	56
FEB	4100	4300	31	-.4	1.2	31
MAR	6700	5600	60	-.8	1.7	60
APR	5500	6600	38	-.4	1.5	38
MAY *	8900	4500	27	-.6	1.0	27
JUN *	3800	4900	86	.4	1.5	90
JUL *	3000	6400	118	-.5	1.4	119
AUG *	2400	6300	91	-.3	1.7	98
SEP						
OCT						
NOV 82						

* Deployed

TABLE B-1 AVERAGE EXCESS FUEL AT LANDING AND PLANNED VS. ACTUAL FLIGHT TIME DEVIATION – SQUADRON B

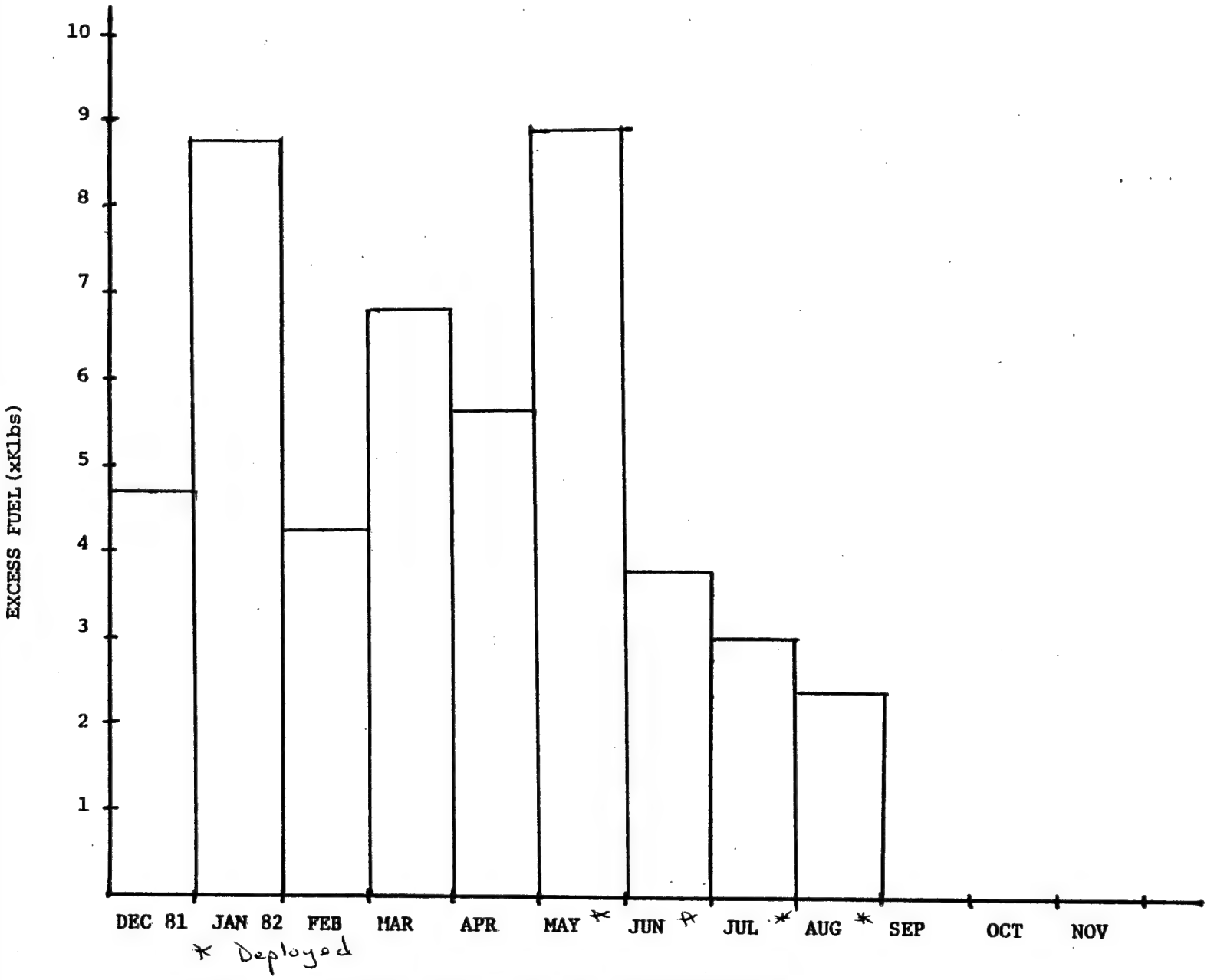


FIGURE B-1 AVERAGE EXCESS FUEL AT LANDING-SQUADRON B

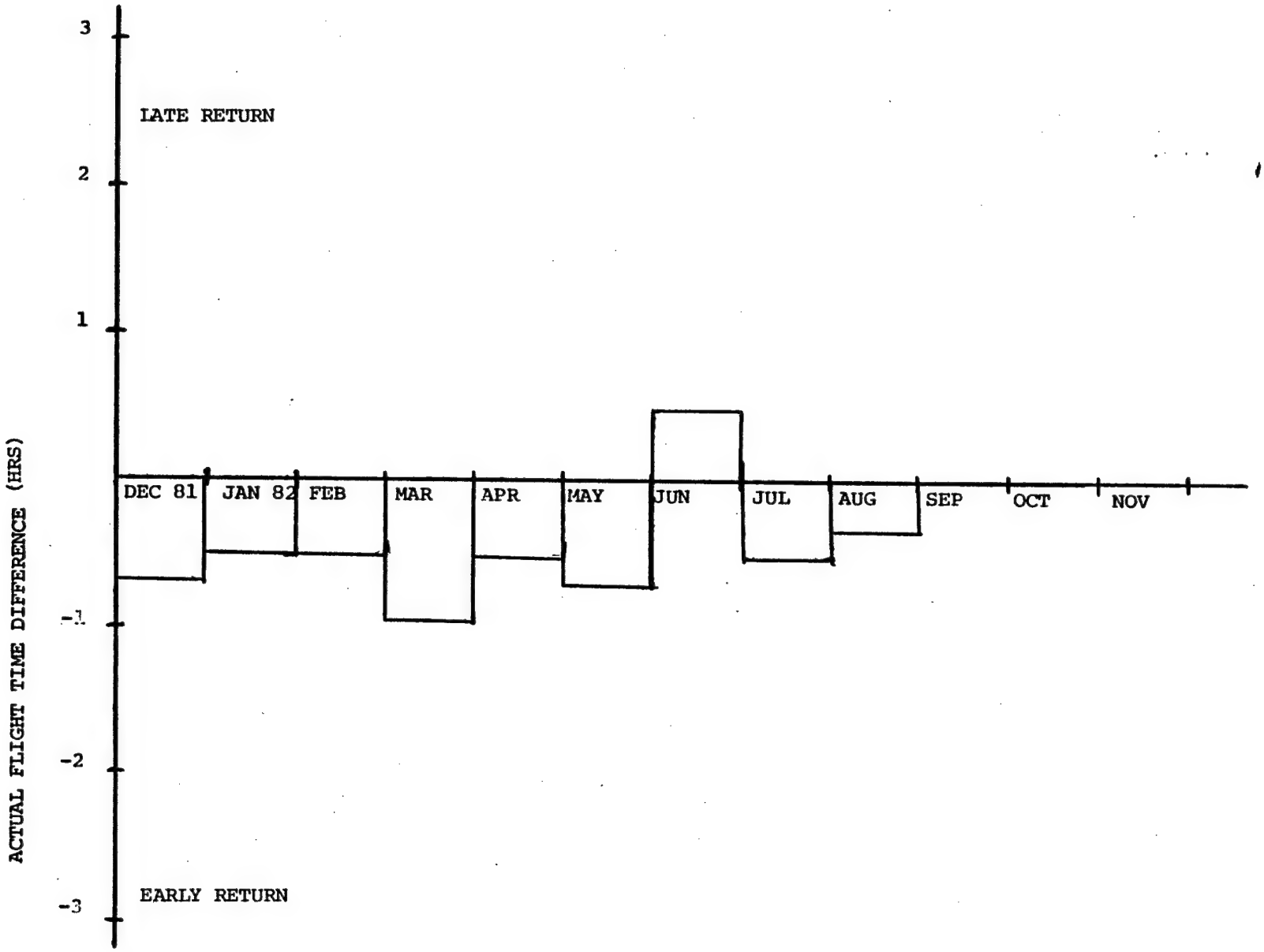


FIGURE B-2 AVERAGE FLIGHT TIME DEVIATION PLANNED VS. ACTUAL FLIGHT TIME - SQUADRON B

```
OVR06  ~  EXCESS FUEL AT ENG SHUTDOWN VS EXP FLT HRS                (N= 86)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL        DRAG:ALL
TIME SPAN:  1/ 6/82 TO 30/ 6/82  PILOT: ALL          FPC: ALL    82/08/04

EXCESS FUEL              EXPECTED FLIGHT HRS
AT SHTDOWN               ------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12    0 ^     0                 ^       ^           ^
    10      0   0                             ^
     8        V       ~               ~                                  KEY
     6      V ~                   0   0           0       ~          ~    MAXIMUM
     4                                0   0                   0
     2        0     0   0                       V 0 0 0
     0                    V   V                     V   0                0    MEAN
    -2        V         V               V
    -4                                      V           V   V            V    MINIMUM
    -6
    -8
   -10
   -12
SAMPLE    1   2   1   0   0   0   0   0   0   1   1   0
 SIZE:      5   2   1   4   6   3   3   8   4  27  13   4

AVERAGE EXCESS FUEL:   3785.     STANDARD DEVIATION:    4880.
```

FIGURE B-3 EXCESS FUEL AT LANDING JUNE - SQUADRON B

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS                (N= 90)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL        DRAG:ALL
TIME SPAN:  1/ 6/82 TO 30/ 6/82  PILOT: ALL          FPC: ALL    82/08/04

EXPECTED                 EXPECTED FLIGHT HRS
- ACTUAL                 ------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4                        ~           ~
     3                    ~                       ~       ~
     2                            ~               ~       0
     1      ~ ~ ~ 0           0       ~   0   0       ~
     0    0 0               0   V   0   0               0 0 0   V
    -1        0       0                   V   V       0 V   V
    -2        V           V
    -3
    -4          0
    -5
SAMPLE    1   2   1   0   0   0   0   0   0   1   1   0
 SIZE:      5   2   1   4   9   3   3   8   4  28  13   4

AVERAGE DIFFERENCE HRS:     .4     STANDARD DEVIATION:     1.5
```

FIGURE B-4 ACTUAL VS. PLANNED FLIGHT TIME VARITATION JUNE - SQUADRON B

```
DVR06      EXCESS FUEL AT LAND VS EXP FLT HRS                    (N=118)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 31/ 7/82  PILOT: ALL          FPC: ALL   82/09/09

EXCESS FUEL                EXPECTED FLIGHT HRS
** LAND                    ------------------
   00 LBS   1   2   3   4   5   6   7   8   9  10  11  12
     12                    ^
     10       0   0
      8         ^       ^                   ^   ^
      6       V 0 V                     0 0                 ^
      4         V           ^       ^                   0
      2               ^ 0       0                           0 0 0
      0               0                 0       0   0 0         V
     -2                   0
     -4               V       V   V   V       V
     -6                   V                           V
     -8                 V                       V           V
    -10
    -12
SAMPLE    0   2   0   4   0   0   1   0   0   1   0   1
 SIZE:      8   8   2   6  11   3   6  10  10  23  19   3

AVERAGE EXCESS FUEL:   2992.     STANDARD DEVIATION:    6365.
```

FIGURE B-5 EXCESS FUEL AT LANDING JULY - SQUADRON B

```
DVR05              EXPECTED VS ACTUAL FLIGHT HRS                 (N=119)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 31/ 7/82  PILOT: ALL          FPC: ALL   82/09/09

ACTUAL -                   EXPECTED FLIGHT HRS
XPECTED                    ------------------
.T HRS     1   2   3   4   5   6   7   8   9  10  11  12
      5
      4
      3                                           ^
      2
      1         ^     ^     ^   ^   ^   ^       ^   ^
      0       0 0     0 0 0 0     0       0   0 0       0 ^
     -1         V 0       V   0                       0   0   0
     -2                                0 0   V   V
     -3                        V       V
     -4
     -5                                                   V
SAMPLE    0   2   0   4   1   0   1   0   0   1   0   1
 SIZE:      9   9   2   6  11   3   6  10  10  23  18   2

AVERAGE DIFFERENCE HRS:   -.5     STANDARD DEVIATION:    1.4
```

FIGURE B-6 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JULY - SQUADRON B

```
OVR06      EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 91)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL    82/09/28

EXCESS FUEL              EXPECTED FLIGHT HRS
AT LAND                  ------------------
X1000 LBS    1   2   3   4   5   6   7   8   9  10  11  12
    12   0   0                   0
    10   V                       ^   ^
     8       ^
     6           0       ^           0       0
     4       0       ^   ^   0   ^   0           0       ^
     2                       0                       0   ^   0
     0                   0   0       0   V   0               ^
    -2                       V                           V
    -4       V           V       V   V           V       0       0
    -6                       V                       V
    -8                                       0   V           V
   -10
   -12
SAMPLE    3   1   0   2   2   1   1   1   1   0   2   0
 SIZE:      6   1   0   8   7   2   3   4  10  26   6   4

AVERAGE EXCESS FUEL:    2440.      STANDARD DEVIATION:     4244
```

FIGURE B-7 EXCESS FUEL AT LANDING AUGUST - SQUADRON B

```
OVR05                EXPECTED VS ACTUAL FLIGHT HRS                (N= 98)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL    82/09/28

ACTUAL -                 EXPECTED FLIGHT HRS
EXPECTED                 ------------------
FLT HRS      1   2   3   4   5   6   7   8   9  10  11  12
     5
     4
     3                                                   ^
     2       0                       ^               ^   ^
     1                           ^       0   ^   0   ^               ^
     0     0   V       0   0   0   0   ^               0   0   0   0   0
    -1           0   0           V   0   0   V   0   0               0       V
    -2                   0       V                       V   0   V       V
    -3                                       V
    -4                           V   0                           V
    -5
SAMPLE    3   1   1   2   2   1   1   1   1   0   1   0
 SIZE:      6   2   1   9   7   2   3   4  10  26  10   4

AVERAGE DIFFERENCE HRS:    -.3     STANDARD DEVIATION:     1.7
```

FIGURE B-8 ACTUAL VS. PLANNED FLIGHT TIEM VARIATION AUGUST - SQUADRON B

MONTH	ASW		SS		DS		FAM		XCTY		OTHER	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81	4035	9	4226	1	3092	2	3493	5	3830	7	4284	5
JAN 82	4164	22	4011	2	3703	1	4375	8	3502	23	4194	12
FEB	4420	13	4115	3	—	0	4361	8	3868	13	4090	9
MAR	4261	24	4433	1	3805	3	4186	11	4232	6	5111	14
APR	4248	12	4224	1	4440	1	4328	8	4604	19	3574	12
MAY *	4176	18	4268	2	—	0	4474	8	4399	30	4190	1
JUN *	4231	56	3819	3	4294	3	4327	9	3465	12	4686	7
JUL *	4176	68	4084	8			4251	8	4208	21	4096	12
AUG *	4018	59	4214	1	4290	1	3482	12	4099	19	4073	7
SEP												
OCT												
NOV 82												

* Deployed

TABLE B-2 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON B

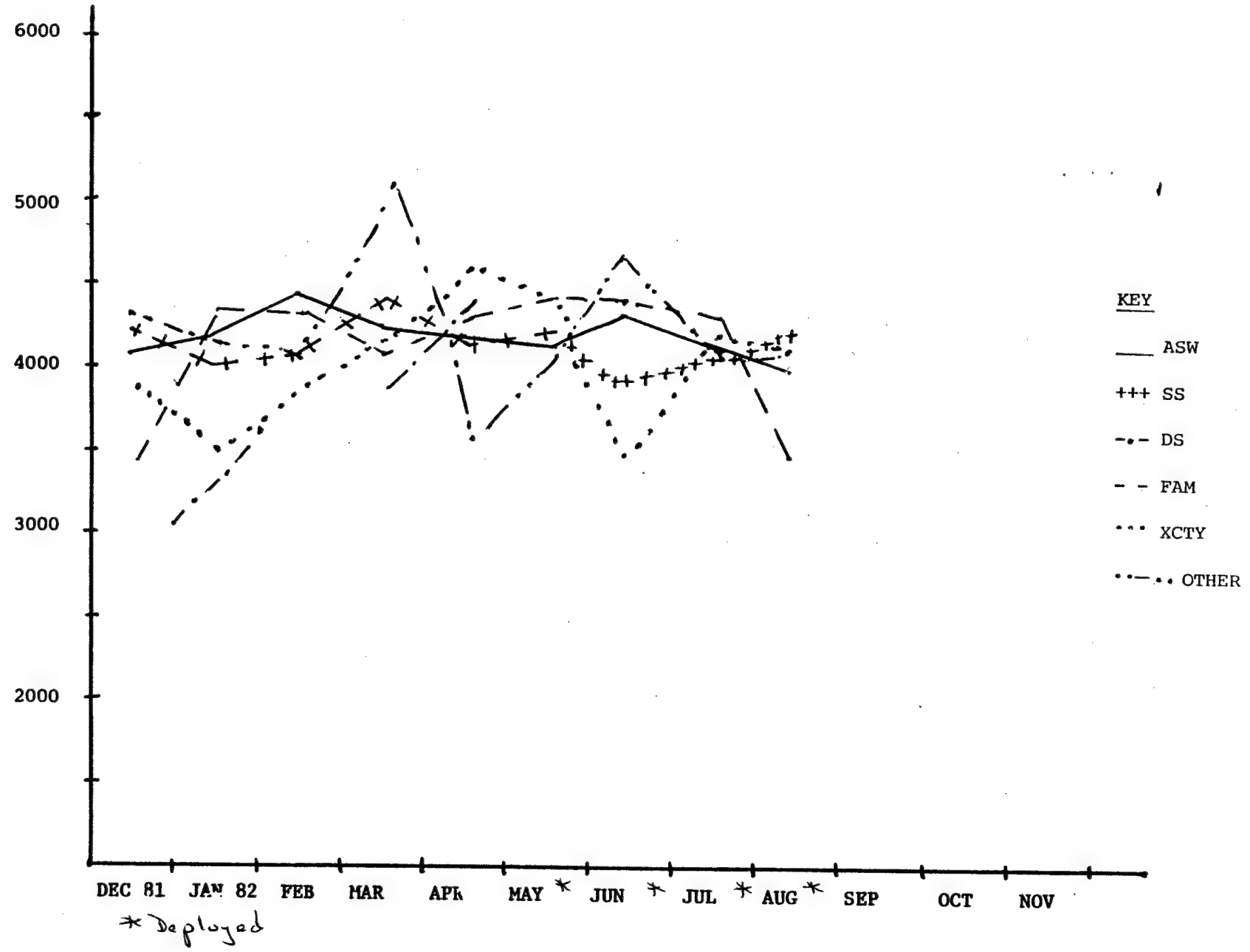


FIGURE B-9 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON B

MONTH	PREFLIGHT		CLIMB		CRUISE-OUT		ONSTATION		CRUISE-IN		DESCENT		POSTFLIGHT	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81	838	25	7782	24	4505	23	4089	14	5640	5	3307	17	2117	21
JAN 82	277	50	7601	61	4808	33	4071	26	—	0	4150	53	1965	49
FEB	401	35	8298	49	4298	32	4096	19	5991	7	3037	31	2702	31
MAR	286	51	7420	50	4703	47	4342	35	5828	7	3302	33	2153	45
APR	—	0	7156	46	4631	34	4064	19	5250	2	2962	30	2059	40
MAY *	243	40	7413	52	5154	37	4172	17	7116	5	3504	27	1960	52
JUN *	228	68	7658	74	5264	73	4150	62	5340	14	3157	59	2694	79
JUL *	265	83	7116	98	5051	88	4123	80	6780	12	3159	83	2542	110
AUG *	332	73	7785	79	5477	74	4011	58	5887	18	3044	66	2268	92
SEP														
OCT														
NOV 82														

* Deployed

TABLE B-3 AVERAGE FUEL FLOW BY MISSION PHASE-SQUADRON B

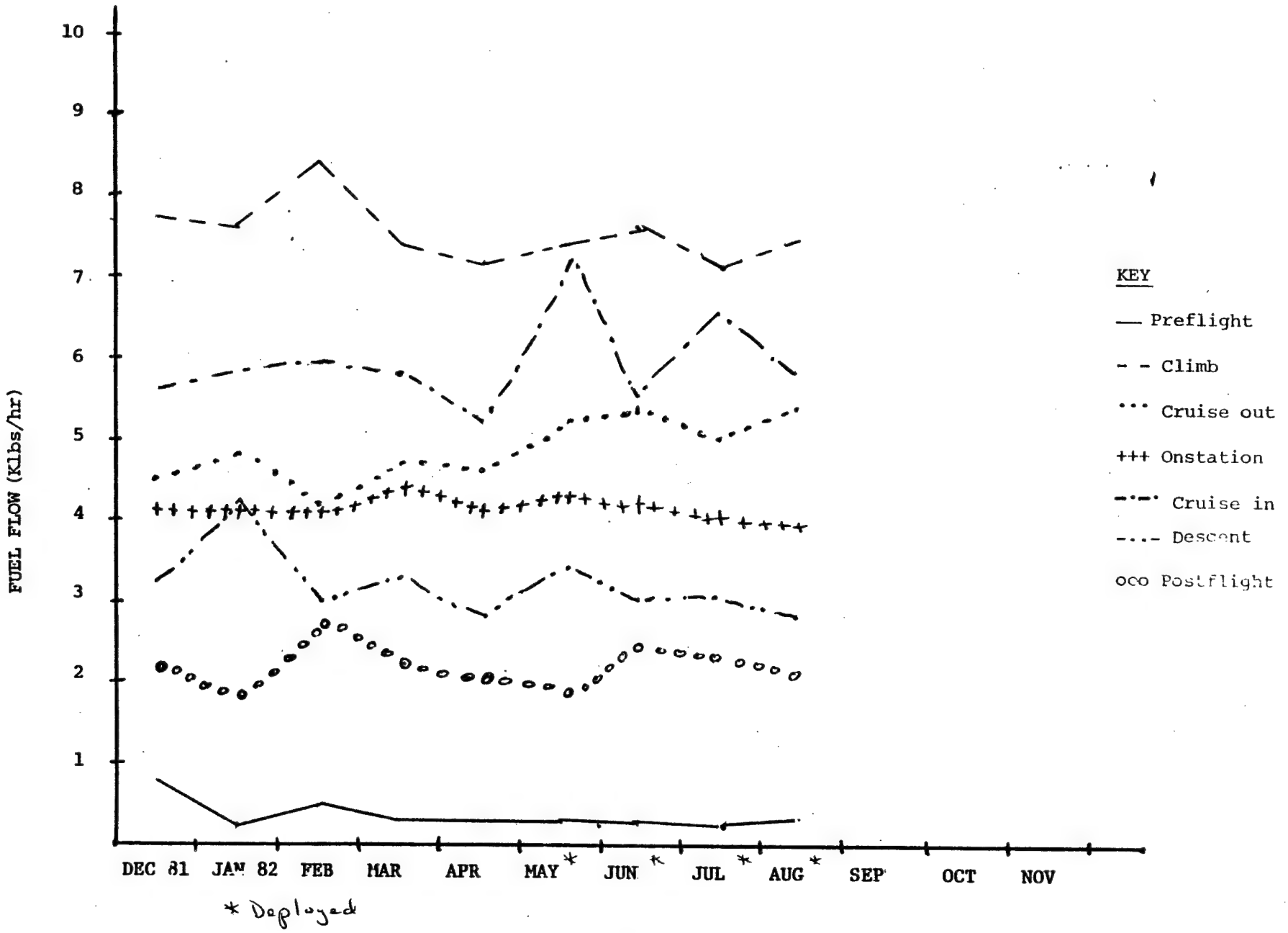


FIGURE B-10 FUEL FLOW BY MISSION PHASE - SQUADRON 8

MONTH	TOTAL FLIGHTS	% FLIGHTS NON OP	% FLIGHTS NON OP GSE USED	AVER NON OP P/F(hr)	PROJECTED NON OP FUEL (lbs)	AVER OP P/F (hrs)	PROJECTED OP FUEL (lbs)	TOTAL P/F FUEL (lbs)
DEC 81	118	61	11	2.5	48,000	3.1	42,780	90,780
JAN82	112	61	9	2.9	53,940	4.3	56,760	110,700
FEB	102	60	20	2.5	36,750	3.2	39,360	76,110
MAR	82	45	3	2.5	27,000	3.2	43,200	70,200
APR	91	70	22	2.0	30,000	3.7	29,970	59,970
MAY *	107	66	15	2.8	50,400	2.7	29,160	79,560
JUN *	124	31	4	2.1	22,680	3.0	77,400	100,080
JUL *	146	28	12	1.9	20,520	2.6	81,900	102,420
AUG *	131	35	16	1.8	20,060	2.3	58,650	79,710
SEP								
OCT								
NOV 82								

* Deployed

TABLE B-4 PROJECTED APU FUEL USED DURING PREFLIGHT (lbs)-SQUADRON B

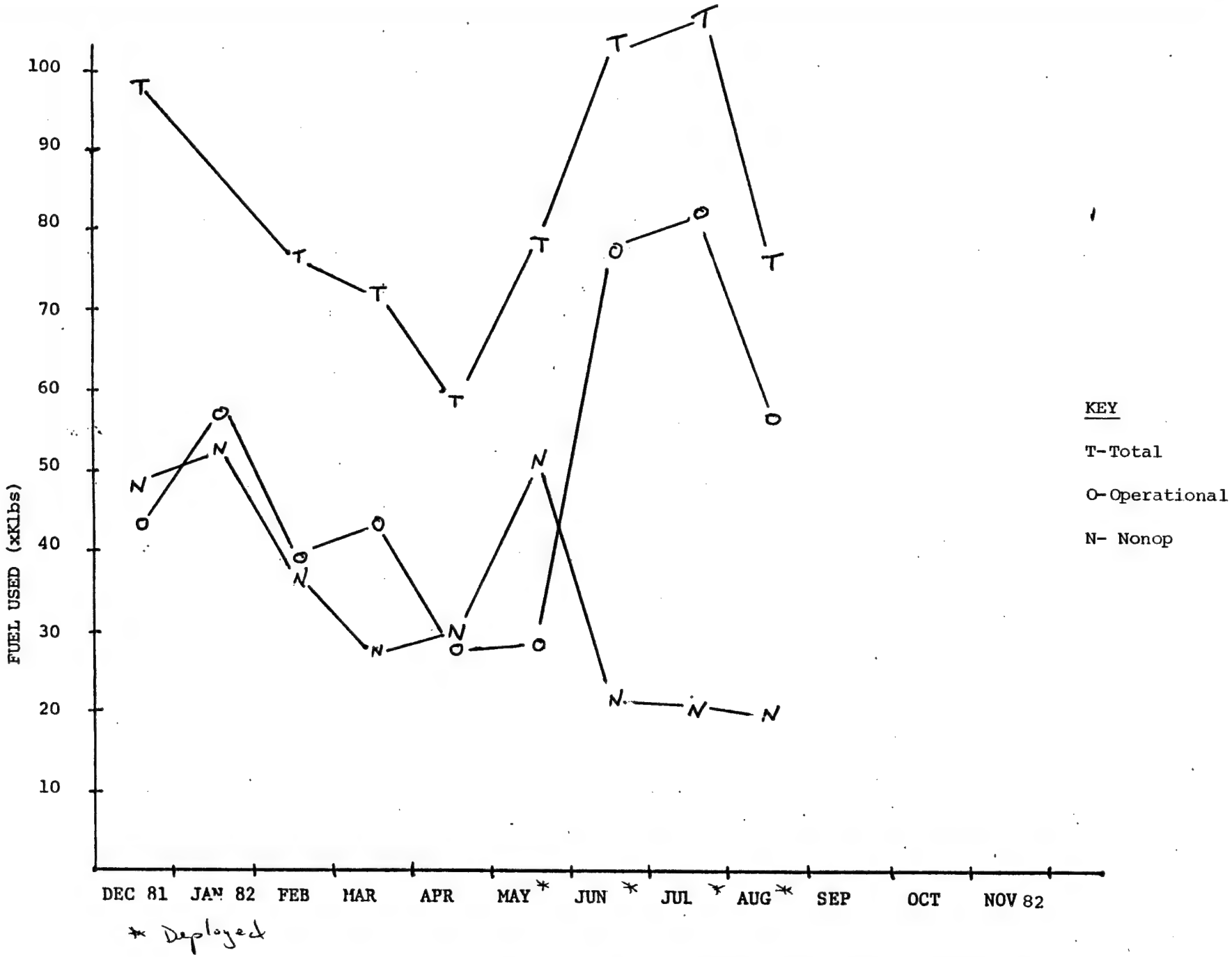


FIGURE B-11 PROJECTED APU FUEL USED DURING PREFLIGHT-SQUADRON

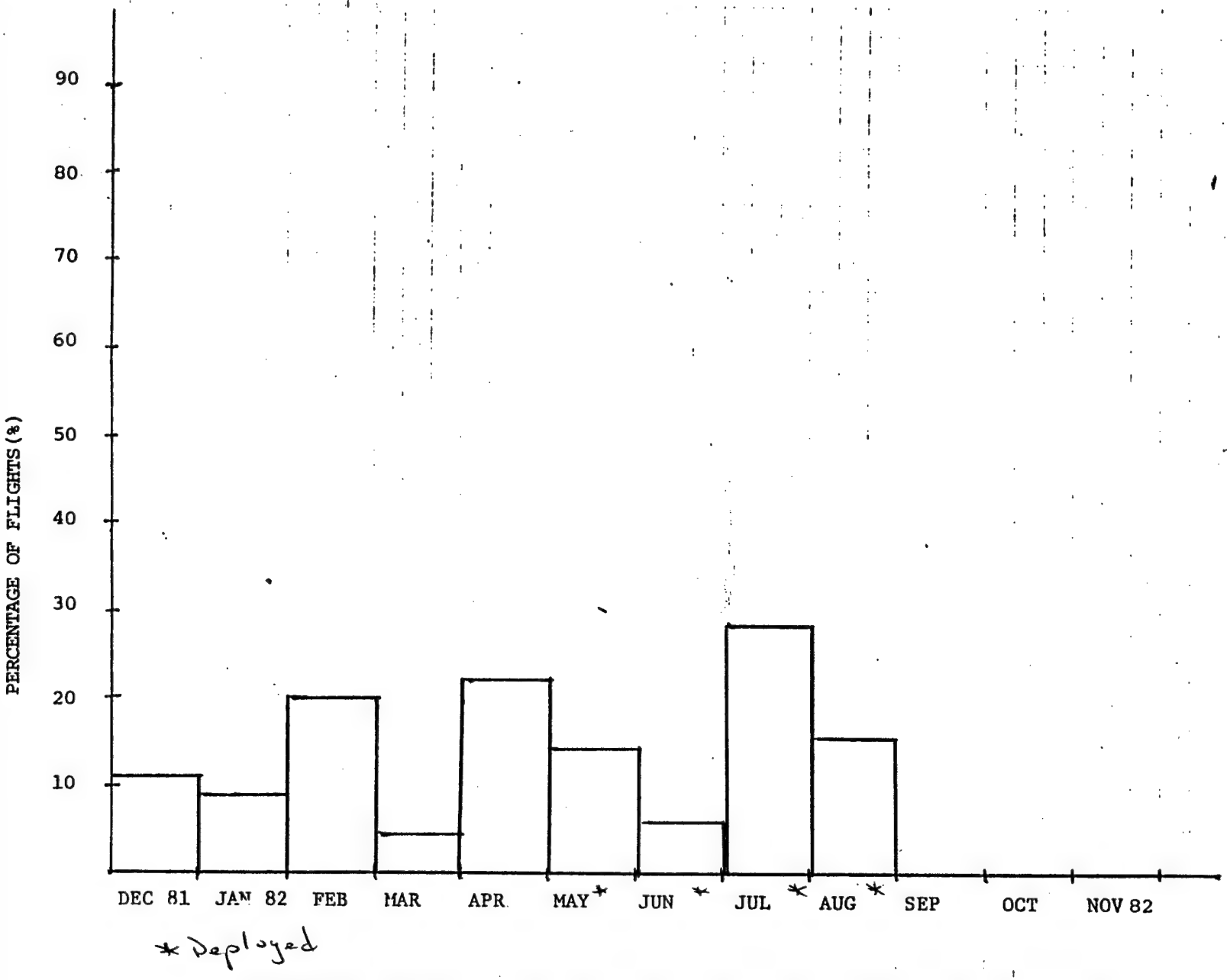


FIGURE B-12 PERCENT OF NON OP FLIGHTS USING GSE AT PREFLIGHT - SQUADRON B

MONTH	0 ENGINES LOITERED		1 ENGINE LOITERED		2 ENGINES LOITERED	
	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES
DEC 81	20	3	73	11	8	1
JAN 82	18	3	75	21	7	2
FEB	10	2	71	15	19	4
MAR	17	6	80	28	3	1
APR	30	6	70	14	0	0
MAY *	6	1	89	16	6	1
JUN *	0	0	51	33	49	32
JUL *	3	2	58	45	40	31
AUG *	0	0	53	30	47	27
SEP						
OCT						
NOV 82						

* Deployed

TABLE B-5 PERCENTAGE AND NUMBER OF OCCURANCES OF 0,1 and 2 ENGINE LOITERED ONSTATION (OPERATIONAL FLIGHTS) – SQUADRON B

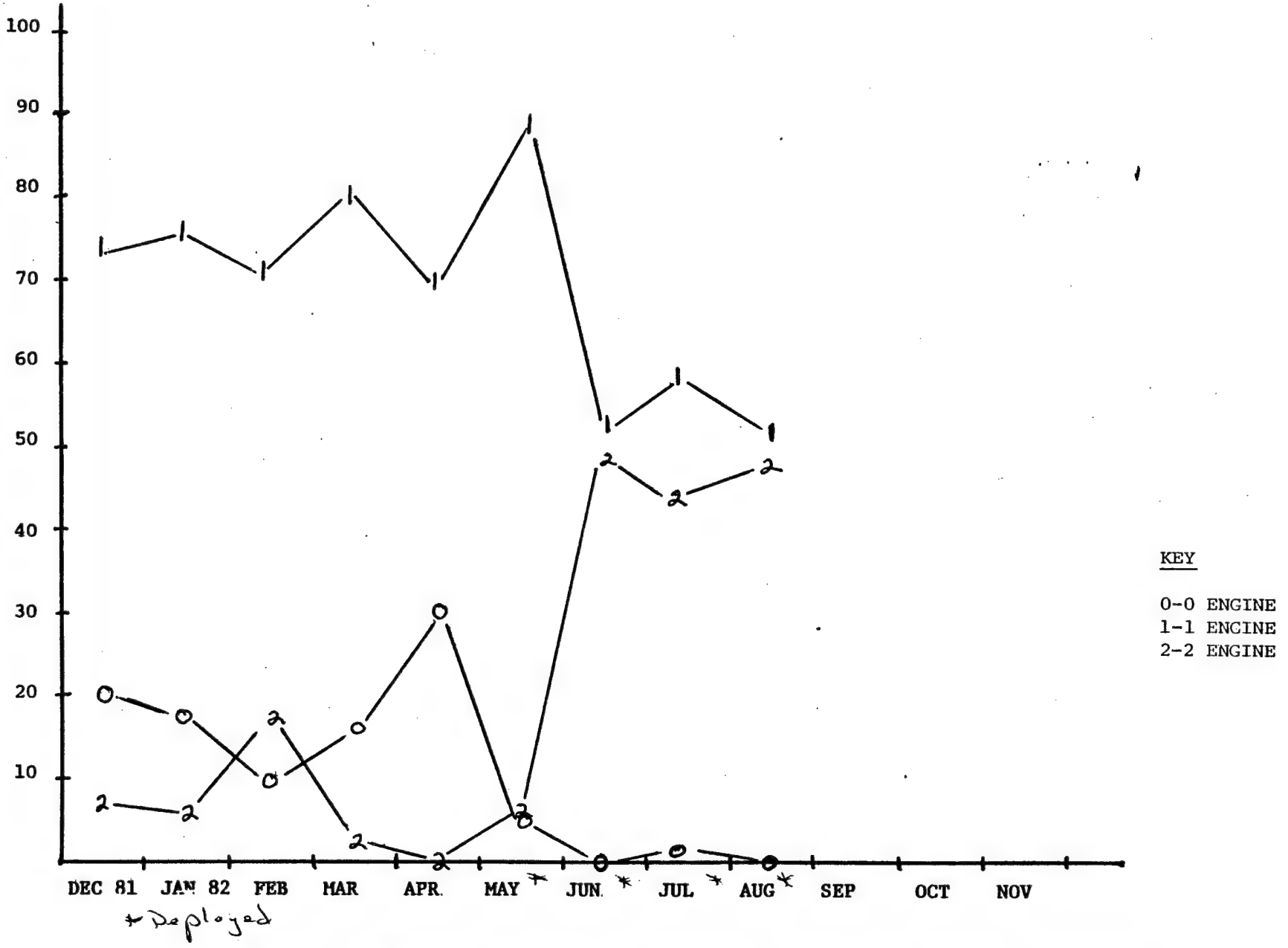


FIGURE B-13 ONSTATION ENGINE LOITER PERCENTAGE (OPERATIONAL FLIGHTS) — SQUADRON B

MONTH	TOTAL FLIGHTS (YELLOW SHEET)	AVERAGE TAXI TIME (min)	ENGINE ON PRIOR TO TAXI (%)			PROJECTED FUEL (lbs)		
			2 ENG	3 ENG	4 ENG	TAXI 2+3 +4 ENGINE	TAXI 2 ENGINE	SAVINGS
DEC 81	118	11	19	0	81			
JAN 82	112	11	19	5	76			
FEB	102	11	41	2	57			
MAR	82	11	31	3	66			
APR	91	12	35	0	65			
MAY *	107	10	33	4	63			
JUN *	124	9	44	11	45			
JUI *	146	9	49	3	48			
AUG *	131	9	59	2	39			
SEP								
OCT								
NOV 82								

PROJECTED FUEL CONSUMED DURING TAXI NOT CALCULATED

* Deployed

TABLE B-6 PROJECTED FUEI SAVINGS DURING TAXI SQUADRON-B

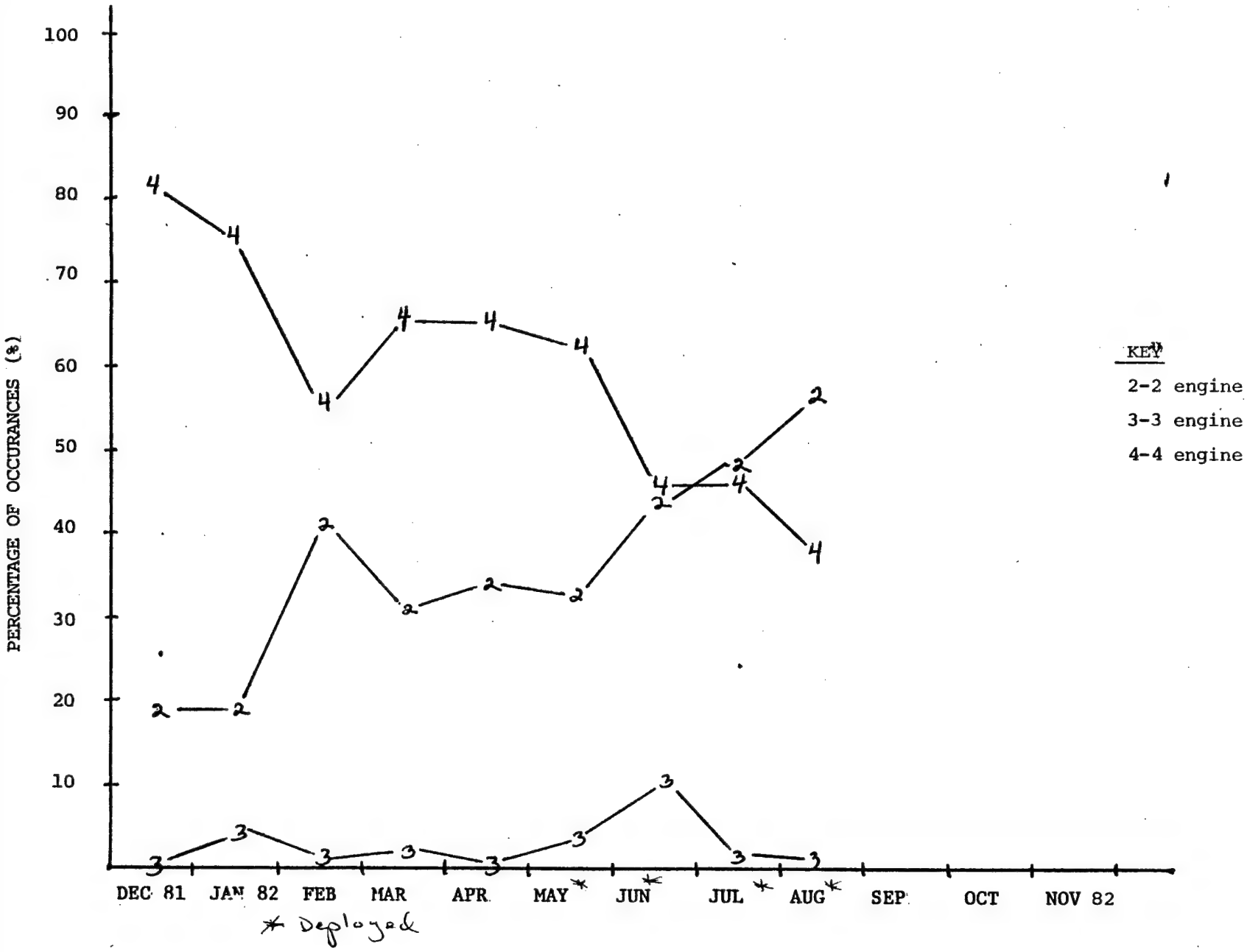


FIGURE B-14 ENGINES ON PRIOR TO TAXI - SQUADRON B

APPENDIX C

SQUADRON C FUEL USAGE BREAKDOWN

MONTH	AVERAGE EXCESS FUEL (lbs)	STANDARD DEVIATION	SAMPLE SIZE	AVERAGE FLIGHT TIME DEVIATION (hrs)	STANDARD DEVIATION	SAMPLE SIZE
DEC 81						
JAN 82	5400	6300	34	-.9	1.4	34
FEB	3000	3400	70	-.4	.9	70
MAR	2900	3400	27	.5	2.2	27
APR	3500	4200	53	-.5	1.0	53
MAY *	3500	3400	69	-.5	1.0	69
JUN *	5600	6600	59	-.5	2.0	62
JUL *	6357	5100	41	-1.8	2.1	47
AUG *	700	3942	27	-.5	1.5	27
SEP						
OCT						
NOV 82						

* Deployed

TABLE C-1 AVERAGE EXCESS FUEL AT LANDING AND PLANNED VS. ACTUAL FLIGHT TIME DEVIATION - SQUADRON C

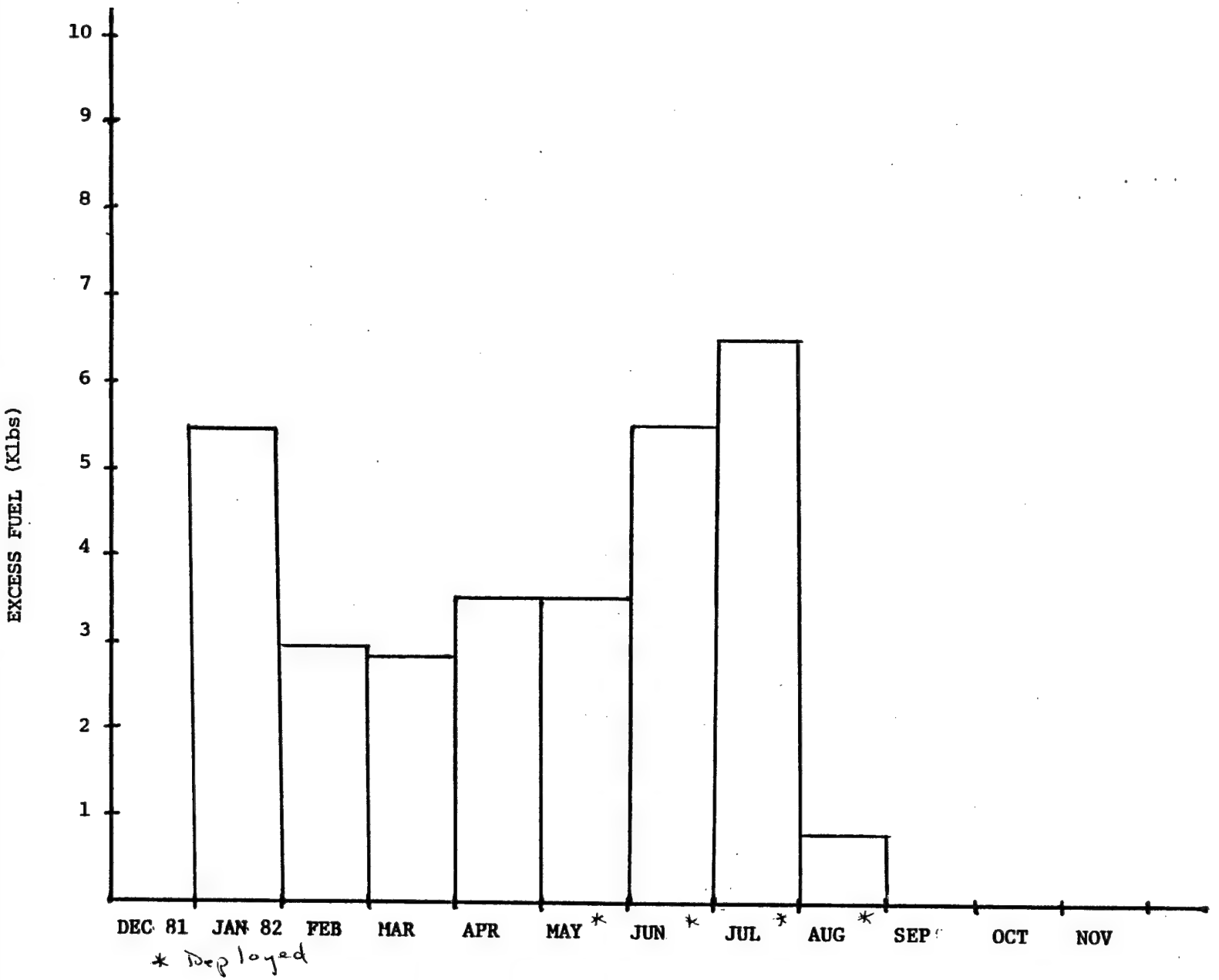


FIGURE C-1 AVERAGE EXCESS FUEL AT LANDING-SQUADRON C

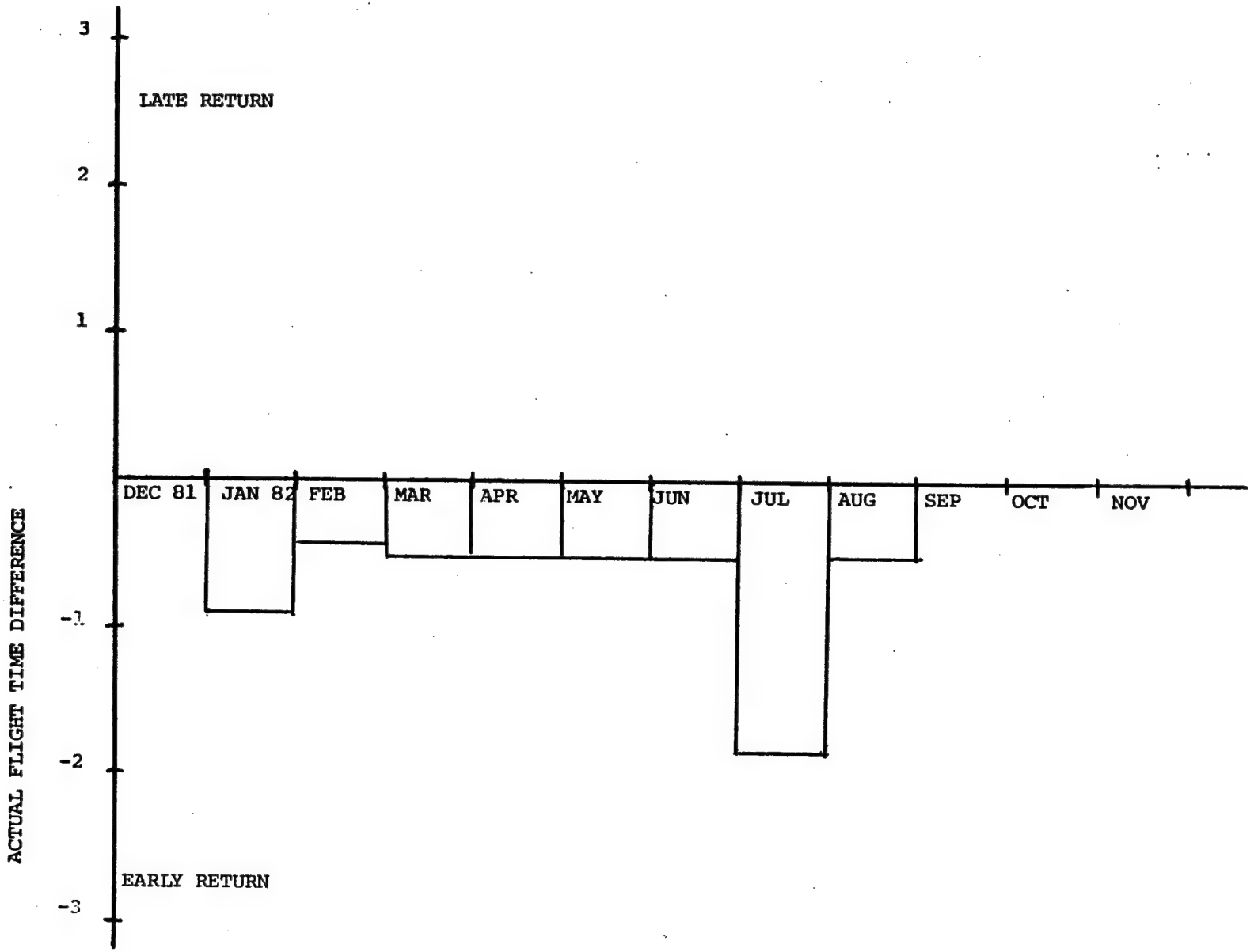


TABLE C-2 AVERAGE FLIGHT TIME DEVIATION PLANNED VS. ACTUAL FLIGHT TIME - SQUADRON C

```
OVR06 ~ EXCESS FUEL AT ENG SHUTDOWN VS EXP FLT HRS                (N= 59)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 6/82 TO 30/ 6/82  PILOT: ALL          FPC: ALL   82/07/27

EXCESS FUEL              EXPECTED FLIGHT HRS
AT SHTDOWN               ------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12                 ^ ^
    10             ^ ^                     0       ^
     8                                 0           0
     6                     0       0   ^
     4           0 0 0     0 0                   V 0     0
     2                                   0       0     0
     0           V V     V V             V
    -2   0            V         V               V
    -4                                                      KEY
    -6                                          V V
    -8                                                      ^  MAXIMUM
   -10                                                      0  MEAN
   -12                                                      V  MINIMUM
SAMPLE    1   0   6   6   1   1   0   0   1   2   1   0
 SIZE:      0   5   9   7   2   2   0   7   6   2   0   0

AVERAGE EXCESS FUEL:   5577.     STANDARD DEVIATION:    6556.
```

FIGURE C-3 EXCESS FUEL AT LANDING JUNE - SQUADRON C

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS                  (N= 62)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 6/82 TO 30/ 6/82  PILOT: ALL          FPC: ALL   82/07/27

EXPECTED                 EXPECTED FLIGHT HRS
- ACTUAL                 ------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4                       ^
     3                   ^
     2               ^       0
     1           ^ ^   0 0 0     0       0     ^ 0 ^
     0       0   0 0   V V   V 0 V         0 0 V 0
    -1           V   0                     V   V   V
    -2
    -3
    -4
    -5
SAMPLE    0   0   6   5   1   1   0   0   1   2   0   0
 SIZE:      1   5  10   8   2   3   0   9   6   2   0   0

AVERAGE DIFFERENCE HRS:    .5    STANDARD DEVIATION:    2.0
```

FIGURE C-4 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JUNE - SQUADRON C

```
OVR06    EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 41)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 30/ 7/82  PILOT: ALL          FPC: ALL    82/08/31

 XCESS FUEL              EXPECTED FLIGHT HRS
AT LAND                  ------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12                                   0   ^
    10                                               0     0
     8           0           0
     6           V 0 ^ 0     V           ^           0
     4     0           0                       V
     2                       0           0
     0   0               V           0           V
    -2               V
    -4
    -6
    -8
   -10
   -12
SAMPLE   1   0   2   4   1   0   0   0   0   0   1   0
 SIZE:     1   0   6   8   5   1   3   4   3   0   0   1

AVERAGE EXCESS FUEL:   6357.     STANDARD DEVIATION:    5117.
```

FIGURE C-5 EXCESS FUEL AT LANDING JULY - SQUADRON C

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 47)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 30/ 7/82  PILOT: ALL          FPC: ALL    82/08/31

 CTUAL -                 EXPECTED FLIGHT HRS
EXPECTED                 ------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4
     3
     2               ^
     1                       ^
     0   0 0             ^ ^         0 0   ^   ^
    -1             ^ 0 0 0 0           V
    -2             0 V V       ^   0       0   0
    -3                   V   0   V                   0
    -4
    -5                                               0
SAMPLE   1   0   2   4   1   0   1   0   0   0   1   0
 SIZE:     1   0   6   9   5   3   3   4   4   0   0   2

AVERAGE DIFFERENCE HRS:  -1.8    STANDARD DEVIATION:    2.1
```

FIGURE C-6 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JULY - SQUADRON C

```
OVR06     EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 27)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  2/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL   82/10/04

  CESS FUEL              EXPECTED FLIGHT HRS
   LAND                  -------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12
    10
     8
     6                          0
     4               ~ 0                      ~   ~
     2                 V                      0
     0               0                    0   V   0
    -2
    -4               V              V              V
    -6           0
    -8                                                 0
   -10
   -12
SAMPLE    0   0   1   2   0   0   0   0   0   0   0   0
 SIZE:      0   0   2   0   0   2   0   1   3  15   1   0

AVERAGE EXCESS FUEL:     700.     STANDARD DEVIATION:    3942.
```

FIGURE C-7 EXCESS FUEL AT LANDING AUGUST - SQUADRON C

```
OVR05                EXPECTED VS ACTUAL FLIGHT HRS              (N= 27)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  2/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL   82/10/04

  'UAL -                  EXPECTED FLIGHT HRS
 - 'ECTED                 -------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4                                    0
     3
     2
     1
     0           0   ~                        0   0   0
    -1             ~ 0              ~
    -2             0                              V
    -3             V                  0
    -4
    -5
SAMPLE    0   0   1   2   0   0   0   0   0   0   0   0
 SIZE:      0   0   2   0   0   2   0   1   3  15   1   0

AVERAGE DIFFERENCE HRS:    -.5    STANDARD DEVIATION:    1.5
```

FIGURE C-8 ACTUAL VS. PLANNED FLIGHT TIME VARIATION AUGUST - SQUADRON C

MONTH	ASW		SS		DS		FAM		XCTY		OTHER	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81											1	
JAN 82	4194	4	4493	1	4211	3	4211	5	4435	22	4127	5
FEB	4163	18	4230	1	—	0	4267	10	4168	30	4285	32
MAR	4095	19	4486	3	3889	1	4260	31	4359	36	4033	14
APR	4297	11	4641	4	4257	1	4474	12	4103	44	4193	33
MAY	4583	24	4241	2	—	0	4007	4	4391	28	4407	47
JUN	4441	17	4995	1	—	0	4263	5	4302	10	4289	29
JUL	4327	11	4738	1	—	0	4542	5	4383	18	4033	22
AUG	4146	17	4469	1	—	0	—	0	3714	3	4258	10
SEP												
OCT												
NOV 82												

TABLE C-2 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUDRON C

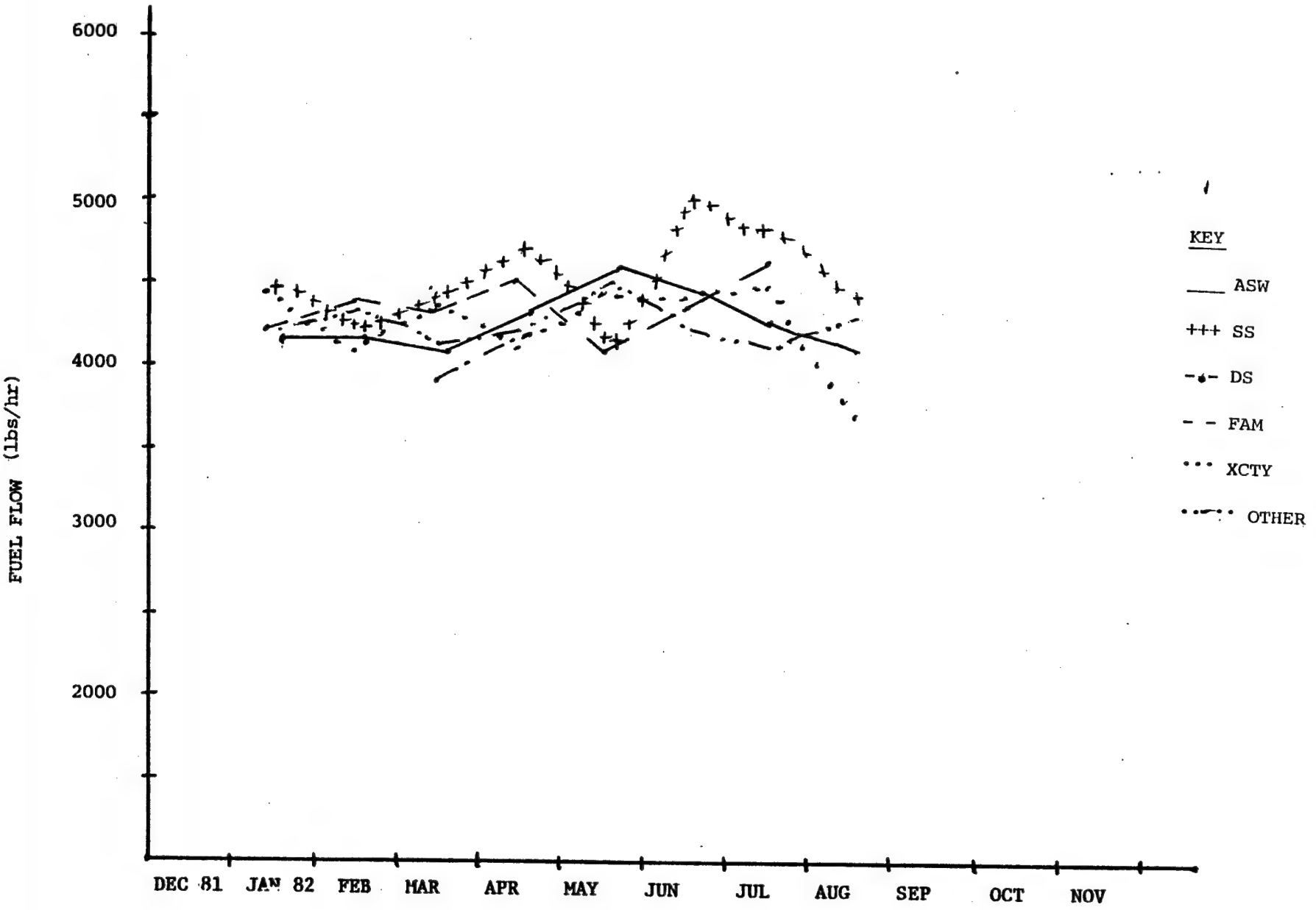


FIGURE C-9 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON C

MONTH	PREFLIGHT		CLIMB		CRUISE-OUT		ONSTATION		CRUISE-IN		DESCENT		POSTFLIGHT	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81														
JAN 82	402	23	7258	37	4041	14	4631	11	—	0	3815	29	2229	27
FEB	—	0	7386	80	5489	39	4028	31	5743	5	3716	71	2151	68
MAR	—	0	8574	93	4593	44	3908	32	5780	3	3461	79	2132	77
APR	477	64	7237	93	4554	43	4714	32	5740	6	3666	75	2359	74
MAY *	270	80	6748	92	5102	56	5041	40	6780	12	3626	77	2404	88
JUN *	536	55	7078	61	5319	48	5170	36	6094	7	3335	43	2569	53
JUL *	312	40	6784	48	4058	19	4277	14	5660	3	3705	39	2460	39
AUG *	345	24	7027	25	5276	16	3840	15	5565	4	2514	21	2520	24
SEP														
OCT														
NOV 82														

* Deployed

TABLE C-3 AVERAGE FUEL FLOW BY MISSION PHASE-SQUADRON C

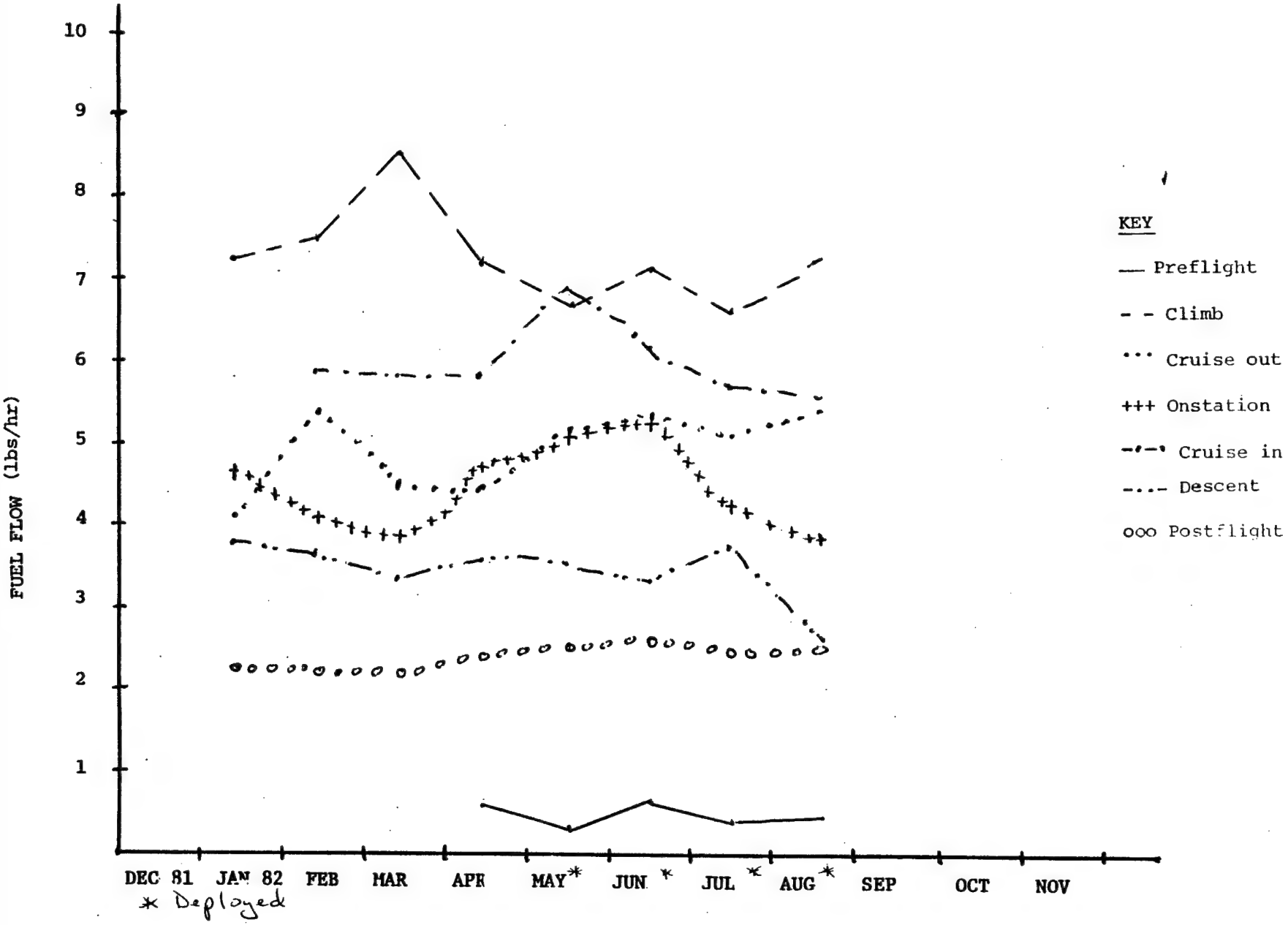


FIGURE C-10 FUEL FLOW BY MISSION PHASE – SQUADRON C

MONTH	TOTAL FLIGHTS	% FLIGHTS NON OP	USED			AVER OP P/F (hrs)		TOTAL FUEL (lbs)
DEC 81								
JAN82	85	75	46	1.9	19,950	4.3	27,090	47,040
FEB	106	80	36	1.8	29,160	2.9	18,270	47,430
MAR	113	71	23	1.8	34,560	2.6	25,740	60,300
APR	104	85	10	2.3	52,440	4.1	19,680	72,120
MAY *	124	76	1	2.5	69,000	3.1	27,900	97,650
JUN *	97	70	12	2.5	25,200	3.8	27,840	53,040
JUL *	85	79	4	1.8	34,560	3.2	17,280	51,840
AUG *	134	41	0	2.6	42,900	2.5	59,250	102,150
SEP								
OCT								
NOV 82								

* Deployed

TABLE C-4 PROJECTED APU FUEL USED DURING PREFLIGHT (lbs) - SQUADRON C

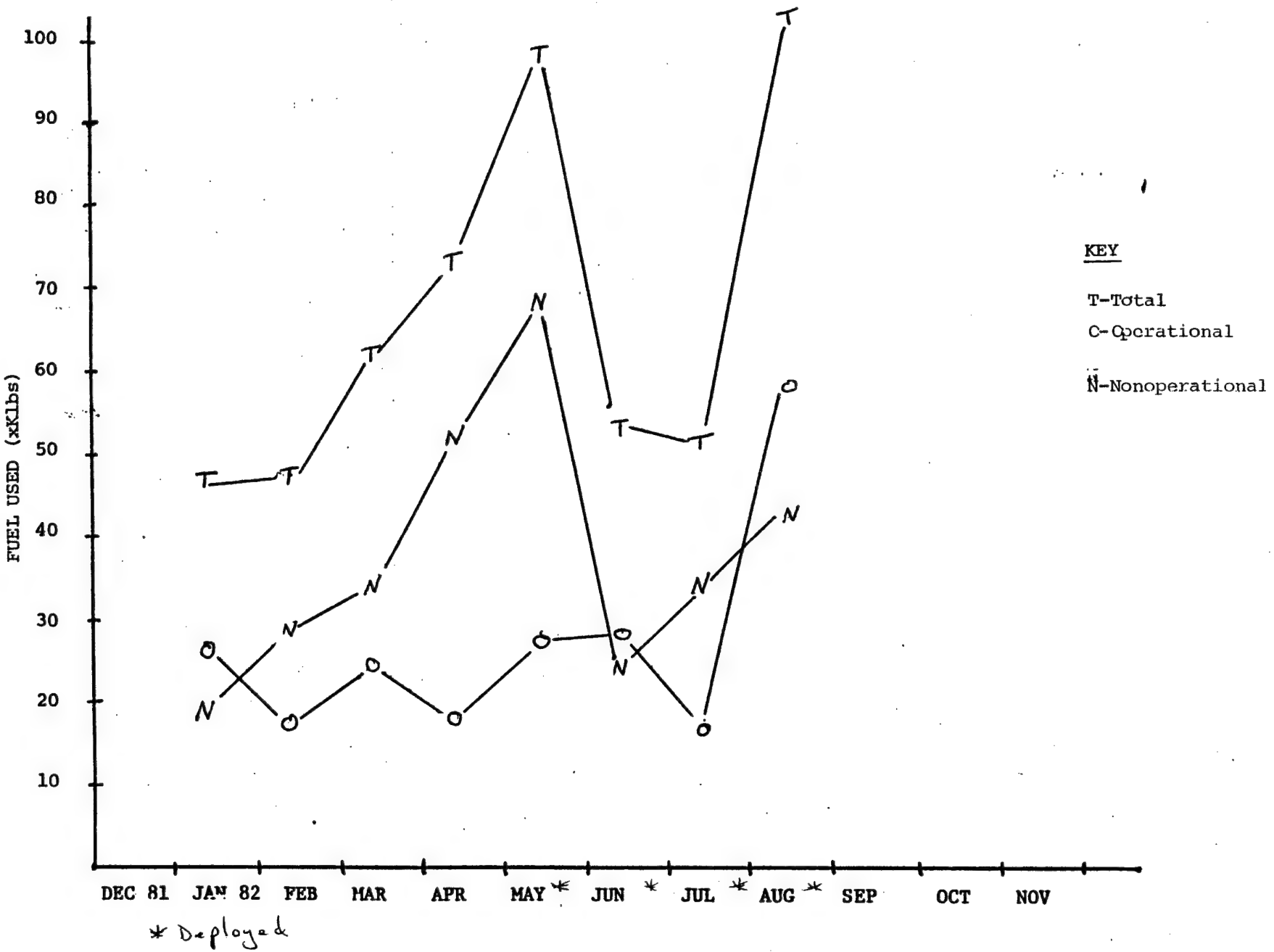


FIGURE C-11 PROJECTED APU FUEL USED DURING PREFLIGHT-SQUADRON C

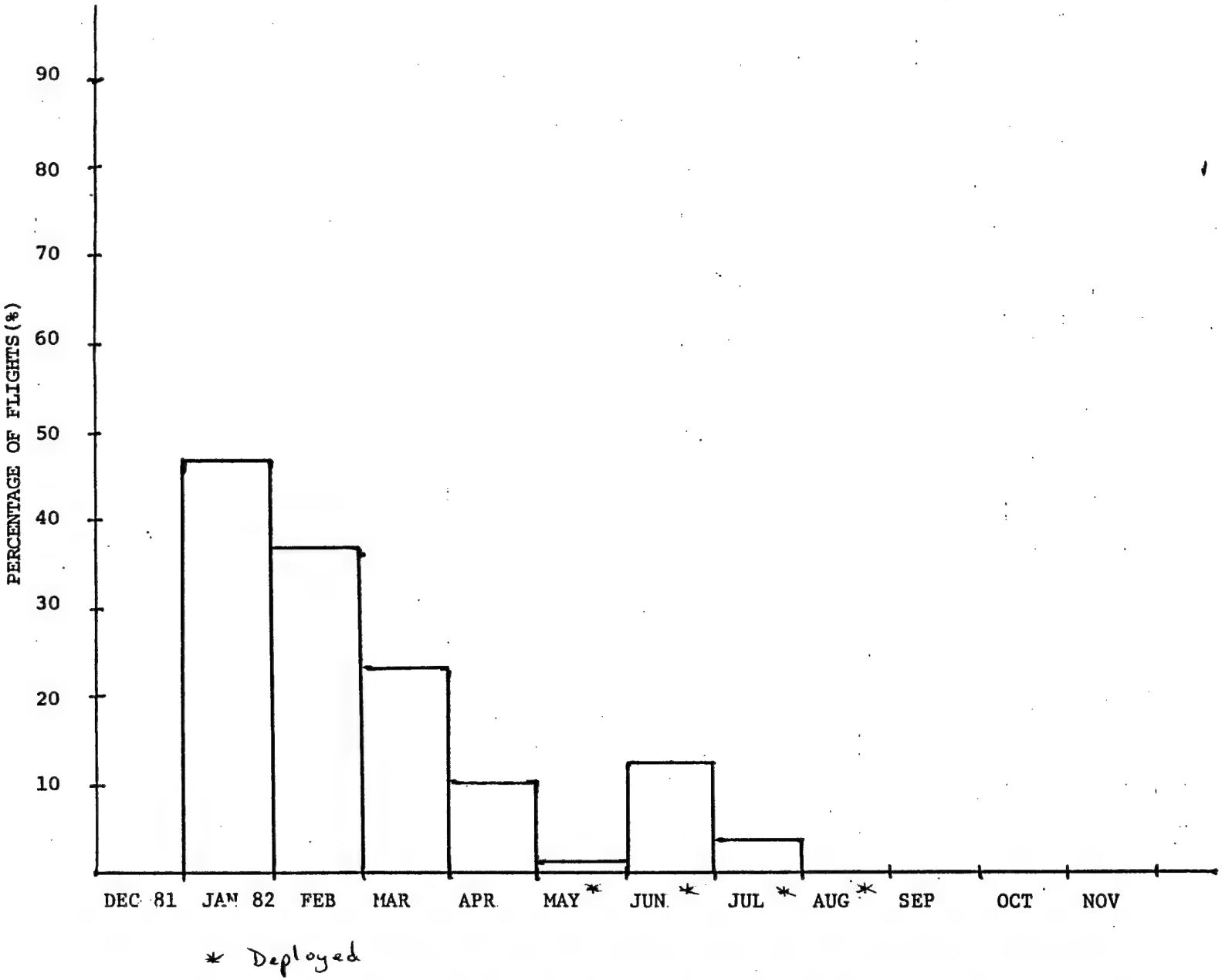


FIGURE C-12 PERCENT OF NON OP FLIGHTS USING GSE AT PREFLIGHT - SQUADRON C

MONTH	0 ENGINES LOITERED		1 ENGINE LOITERED		2 ENGINES LOITERED	
	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES
DEC 81						
JAN 82	27	3	64	7	9	1
FEB	13	4	55	17	32	10
MAR	14	5	51	18	34	12
APR	27	9	64	21	9	3
MAY *	50	21	38	16	12	5
JUN *	42	15	50	18	8	3
JUL *	14	2	79	11	7	1
AUG *	8	1	92	11	0	0
SEP						
OCT						
NOV 82						

* Deployed

TABLE C-5 PERCENTAGE AND NUMBER OF OCCURANCES OF 0,1 and 2 ENGINE LOITERED ONSTATION (OPERATIONAL FLIGHTS) - SQUADRON C

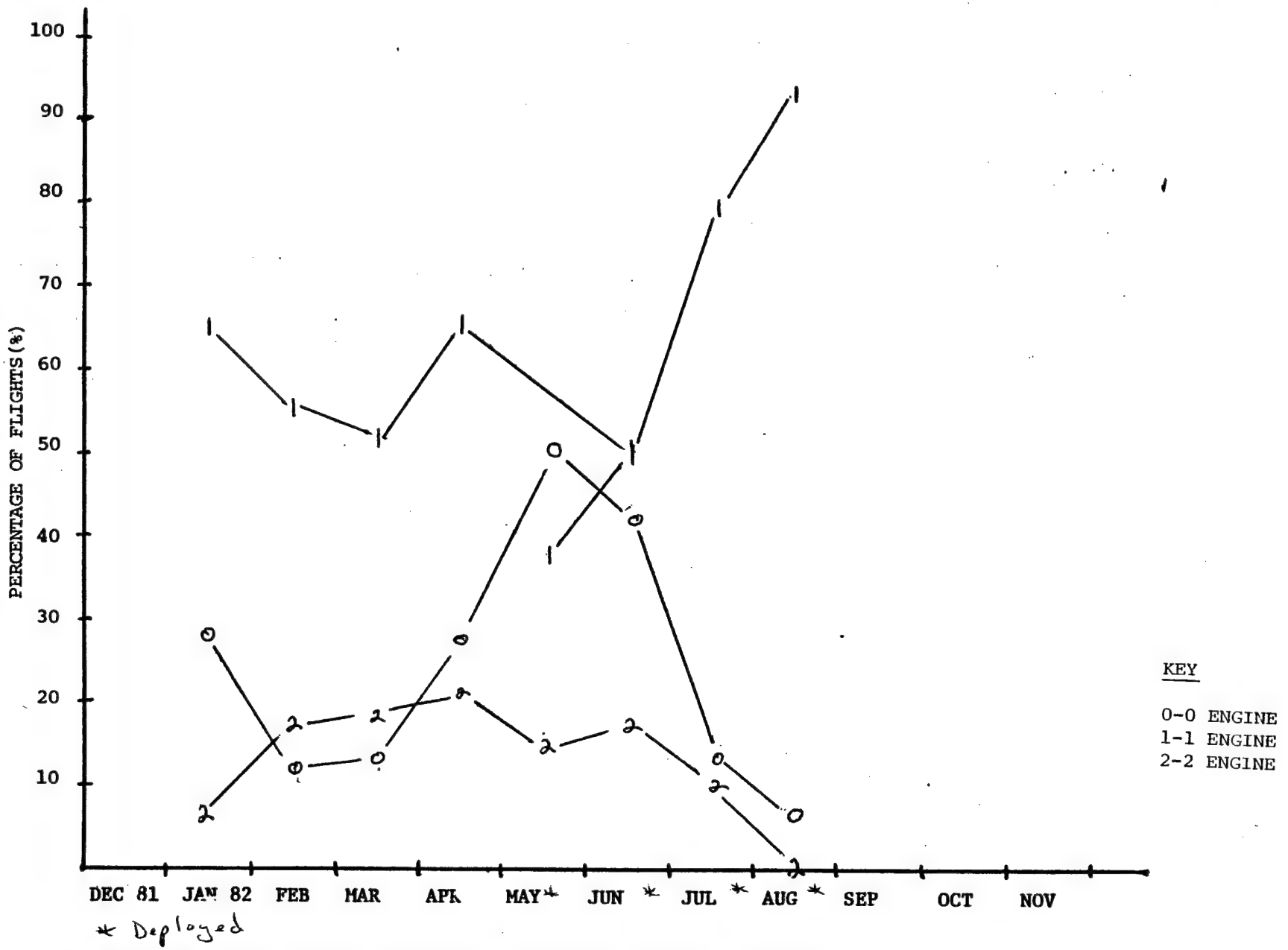


FIGURE C-13 ONSTATION ENGINE LOITER PERCENTAGE (OPERATION FLIGHTS) – SQUADRON C

MONTH	TOTAL FLIGHTS (YELLOW SHEET)	AVERAGE TAXI TIME (min)	ENGINE ON PRIOR TO TAXI (%)			PROJECTED FUEL (lbs)		
			2 ENG	3 ENG	4 ENG	TAXI 2+3 +4 ENGINE	TAXI 2 ENGINE	SAVINGS
DEC 81								
JAN 82	85	11	74	12	15			
FEB	106	10	77	16	7			
MAR	113	10	83	5	13			
APR	104	9	86	8	7			
MAY *	124	9	88	4	9			
JUN *	97	10	93	4	4			
JUL *	85	11	86	5	9			
AUG *	134	11	100	0	0			
SEP								
OCT								
NOV 82								

PROJECTED FUEL CONSUMED DURING TAXI NOT CALCULATED

* Deployed

TABLE C-6. PROJECTED FUEL SAVINGS DURING TAXI-SQUADRON C

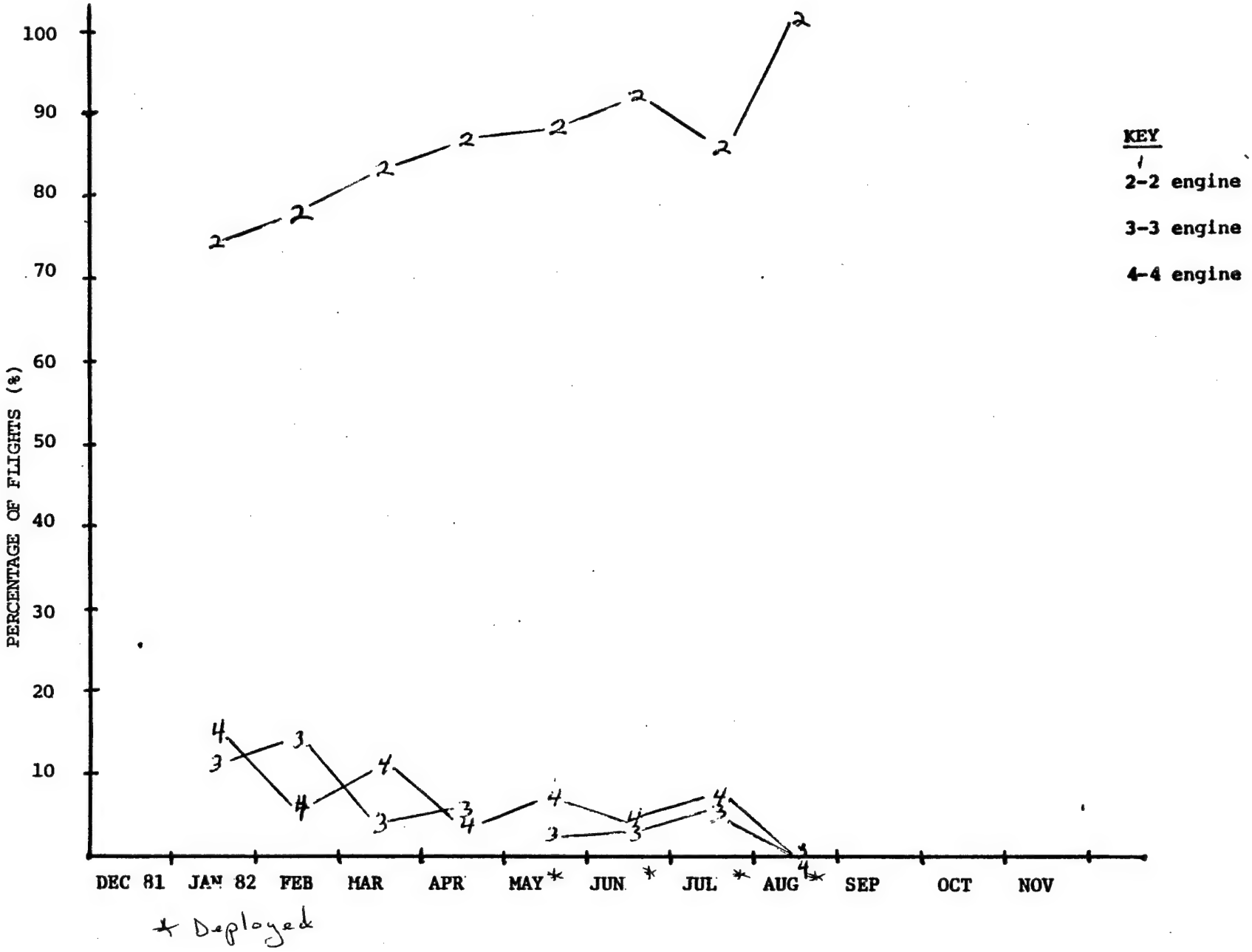


FIGURE C-14 ENGINES ON PRIOR TO TAXI - SQUADRON C

APPENDIX D

SQUADRON D FUEL USAGE BREAKDOWN

MONTH	AVERAGE EXCESS FUEL (lbs)	STANDARD DEVIATION	SAMPLE SIZE	AVERAGE FLIGHT TIME DEVIATION (hrs)	STANDARD DEVIATION	SAMPLE SIZE
DEC 81						
JAN 82						
FEB *	3400	3400	14	-.4	.9	14
MAR *	2100	5500	20	0	1.7	20
APR *	3400	3000	60	-.4	.9	60
MAY *	3800	3700	42	-.4	.9	42
JUN *	4418	5506	50	-.6	1.4	50
JUL *	3101	2400	30	-.4	.6	32
AUG	5100	5800	8	.1	2.7	11
SEP						
OCT						
NOV 82						

* Deployed

TABLE D-1 AVERAGE EXCESS FUEL AT LANDING AND PLANNED VS. ACTUAL FLIGHT TIME DEVIATION - SQUADRON D

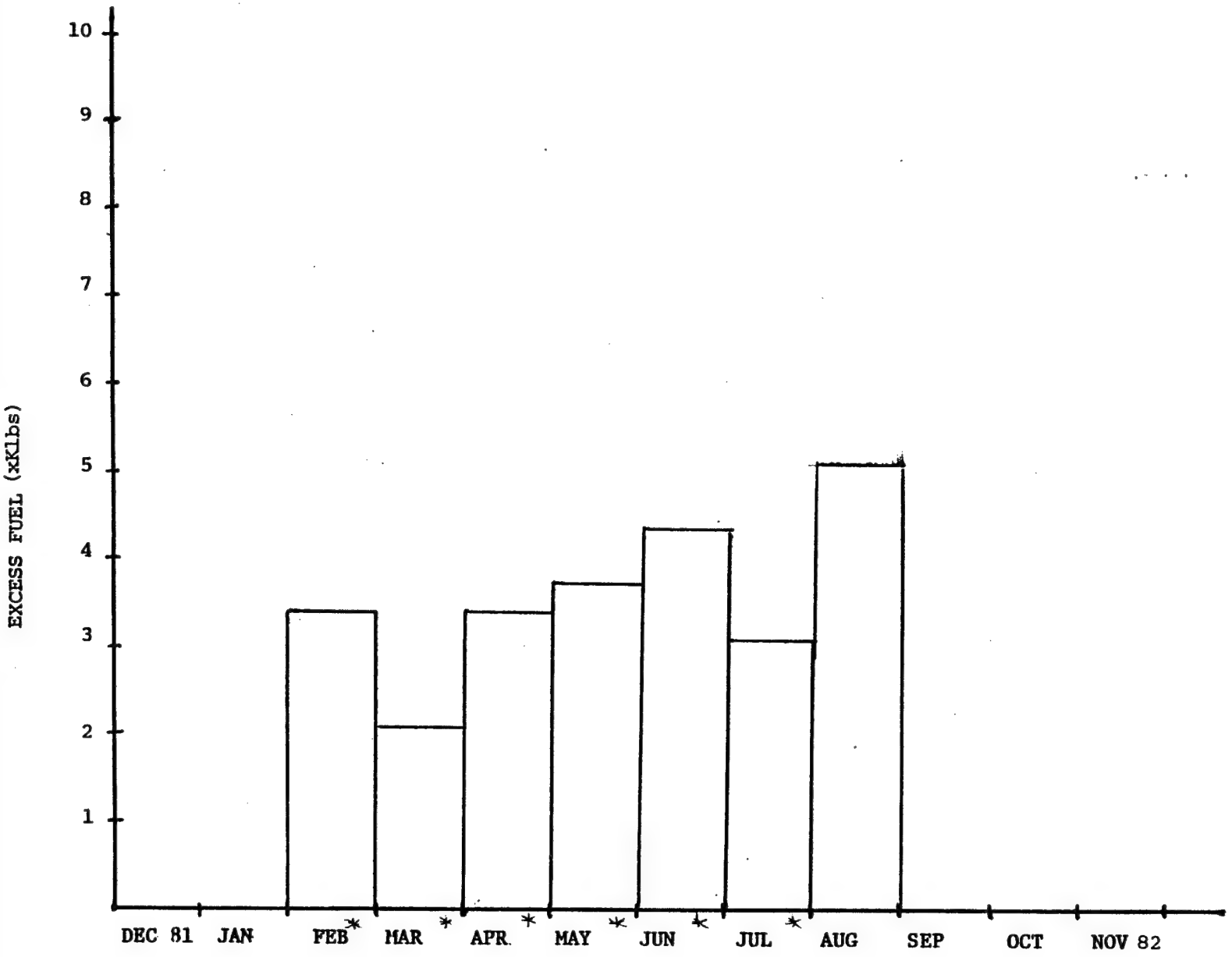
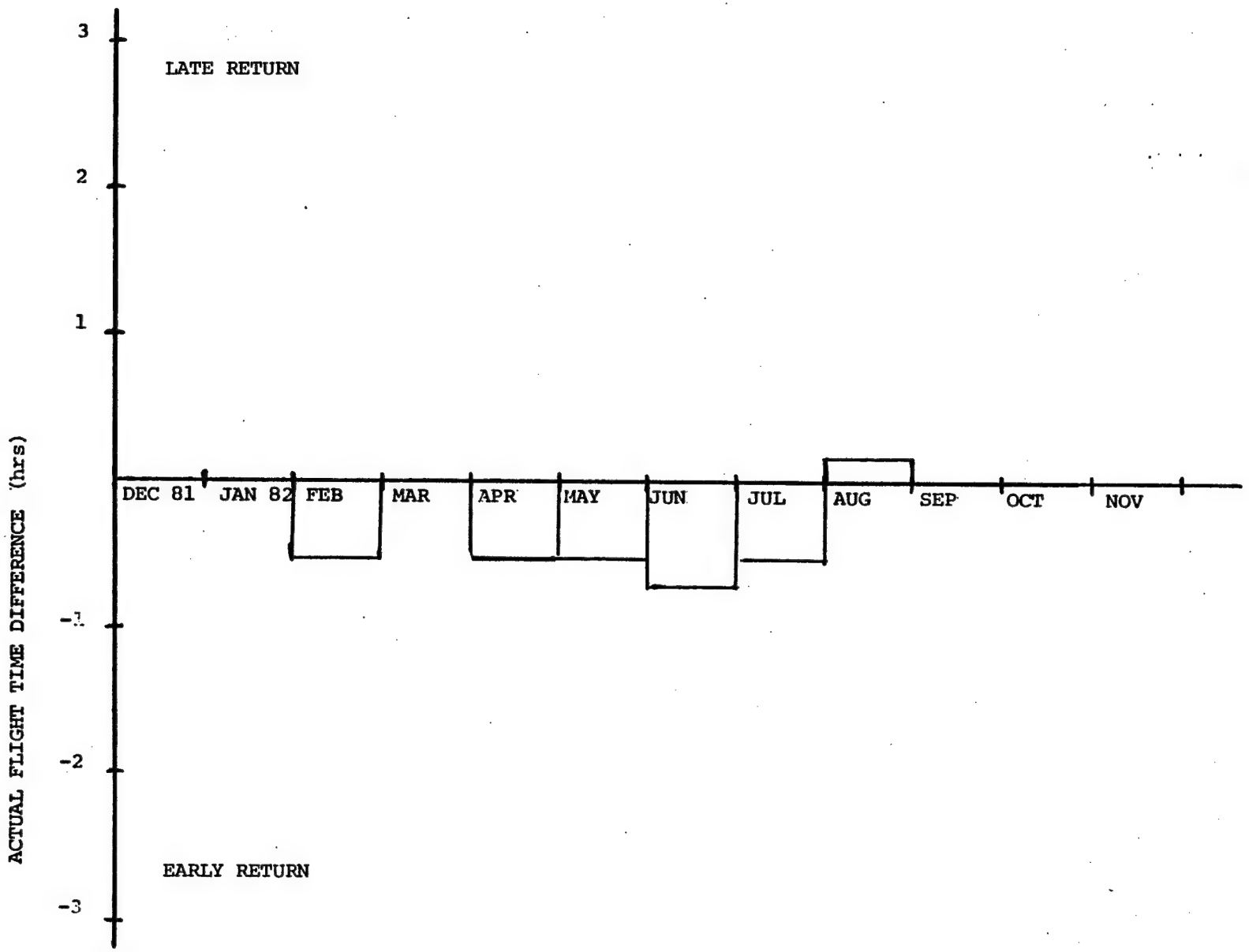


FIGURE D-1 AVERAGE EXCESS FUEL AT LANDING-SQUADRON D



FITURE D-2 AVERAGE FLIGHT TIME DEVIATION PLANNED VS. ACTUAL FLIGHT TIME — SQUADRON D

```
OVR06     EXCESS FUEL AT ENG SHUTDOWN VS EXP FLT HRS          (N= 50)

A/C SIDE # :         MISSION TYPE: ALL     EVENT # : ALL      DRAG:ALL
TIME SPAN:  1/ 6/82 TO 30/ 6/82  PILOT: ALL         FPC: ALL   82/08/11

EXCESS FUEL              EXPECTED FLIGHT HRS
AT SHTDOWN               ------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12           0 ^     0
    10
     8
     6                                   0   0                    KEY
     4               0                       0                ^  MAXIMUM
     2                                   0   V   0
     0           V
    -2                                           V
    -4               V                                       0  MEAN
    -6                                                       V  MINIMUM
    -8
   -10
   -12
SAMPLE    0   0   3   0   1   0   0   1   0   1   0   0
 SIZE:      0   0   8   0   0   0   0   1   7  28   0   0

AVERAGE EXCESS FUEL:   4418.     STANDARD DEVIATION:    5506.
```

FIGURE D-3 EXCESS FUEL AT LANDING JUNE - SQUADRON D

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 50)

A/C SIDE # :         MISSION TYPE: ALL     EVENT # : ALL      DRAG:ALL
TIME SPAN:  1/ 6/82 TO 30/ 6/82  PILOT: ALL         FPC: ALL   82/08/11

EXPECTED                 EXPECTED FLIGHT HRS
- ACTUAL                 ------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5                                           ^
     4
     3                                       ^
     2
     1                                       0   0
     0           0 0     0           0 0         0 V
    -1             V                       V
    -2
    -3
    -4
    -5
SAMPLE    0   0   3   0   1   0   0   1   0   1   0   0
 SIZE:      0   0   8   0   0   0   0   1   7  28   0   0

AVERAGE DIFFERENCE HRS:    .6    STANDARD DEVIATION:    1.4
```

FIGURE D-4 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JUNE - SQUADRON D

```
DVR06      EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 30)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 26/ 7/82  PILOT: ALL          FPC: ALL   82/09/02

EXCESS FUEL              EXPECTED FLIGHT HRS
AT LAND                  ------------------
X1000 LBS    1   2   3   4   5   6   7   8   9  10  11  12
    12
    10
     8                   -                       -
     6                   0           0           0
     4                   V   0
     2       0                                   0
     0           0                       0       V
    -2
    -4
    -6
    -8
   -10
   -12
SAMPLE     0   0   0   0   0   0   1   0   0   0   0   0
 SIZE:       1   1   3   1   0   0   0   1   1  21   0   0

AVERAGE EXCESS FUEL:   3101.     STANDARD DEVIATION:    2384.
```

FIGURE D-5 EXCESS FUEL AT LANDING JULY - SQUADRON D

```
DVR05              EXPECTED VS ACTUAL FLIGHT HRS                 (N= 32)

A/C SIDE # :          MISSION TYPE: ALL      EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 26/ 7/82  PILOT: ALL          FPC: ALL   82/09/02

ACTUAL -                 EXPECTED FLIGHT HRS
EXPECTED                 ------------------
FLT HRS      1   2   3   4   5   6   7   8   9  10  11  12
     5
     4
     3
     2
     1                                           -
     0       0       0                   0   0   0   0
    -1           0       0 0       0
    -2                                           V
    -3
    -4
    -5
SAMPLE     0   0   0   0   1   0   1   0   0   0   0   0
 SIZE:       1   1   3   1   0   0   1   1   1  21   0   0

AVERAGE DIFFERENCE HRS:   -.4     STANDARD DEVIATION:     .6
```

FIGURE D-6 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JULY - SQUADRON D

```
OVR06     EXCESS FUEL AT LAND VS EXP FLT HRS                    (N=  8)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  2/ 8/82 TO 30/ 8/82  PILOT: ALL          FPC: ALL   82/10/05

  CESS FUEL              EXPECTED FLIGHT HRS
nf LAND                  ------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12                                   0
    10
     8                       0
     6       ^           0
     4
     2       0                                   0
     0       V
    -2
    -4
    -6
    -8
   -10
   -12
SAMPLE    0   0   0   0   0   0   0   0   0   0   0   0
 SIZE:      3   0   0   1   1   0   0   1   0   2   0   0

AVERAGE EXCESS FUEL:   5138.     STANDARD DEVIATION:    5752.
```

FIGURE D-7 EXCESS FUEL AT LANDING AUGUST - SQUADRON D

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 11)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  2/ 8/82 TO 30/ 8/82  PILOT: ALL          FPC: ALL   82/10/05

  TUAL -                 EXPECTED FLIGHT HRS
-XPECTED                 ------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5                                   ^
     4       .   0
     3
     2
     1       ^       0
     0       0                           0       0
    -1                   0
    -2                       0
    -3
    -4
    -5                                   V
SAMPLE    0   0   0   0   0   0   0   0   0   0   0   0
 SIZE:      3   1   1   1   1   0   0   2   0   2   0   0

AVERAGE DIFFERENCE HRS:    .1    STANDARD DEVIATION:    2.7
```

FIGURE D-8 ACTUAL VS. PLANNED FLIGHT TIME VARIATION AUGUST - SQUADRON D

MONTH	ASW		SS		DS		FAM		XCTY		OTHER	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81												
JAN 82												
FEB *	4083	11	4436	2	4158	1	4053	2	—	0	4194	1
MAR *	4313	13	4336	1	—	0	3447	1	4442	4	4240	1
APR *	4068	31	4813	2	4248	1	6230	3	4034	10	4337	15
MAY *	4383	28	3956	1	—	0	4423	2	4971	4	4385	21
JUN *	4330	31	4305	2	—	0	—	0	4163	7	4053	5
JUL *	4188	16	—	0	4846	1	—	0	4338	5	3449	4
AUG	4100	2	—	0	—	0	—	0	3551	5	2853	4
SEP												
OCT												
NOV 82												

* Deployed

TABLE D-2 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON D

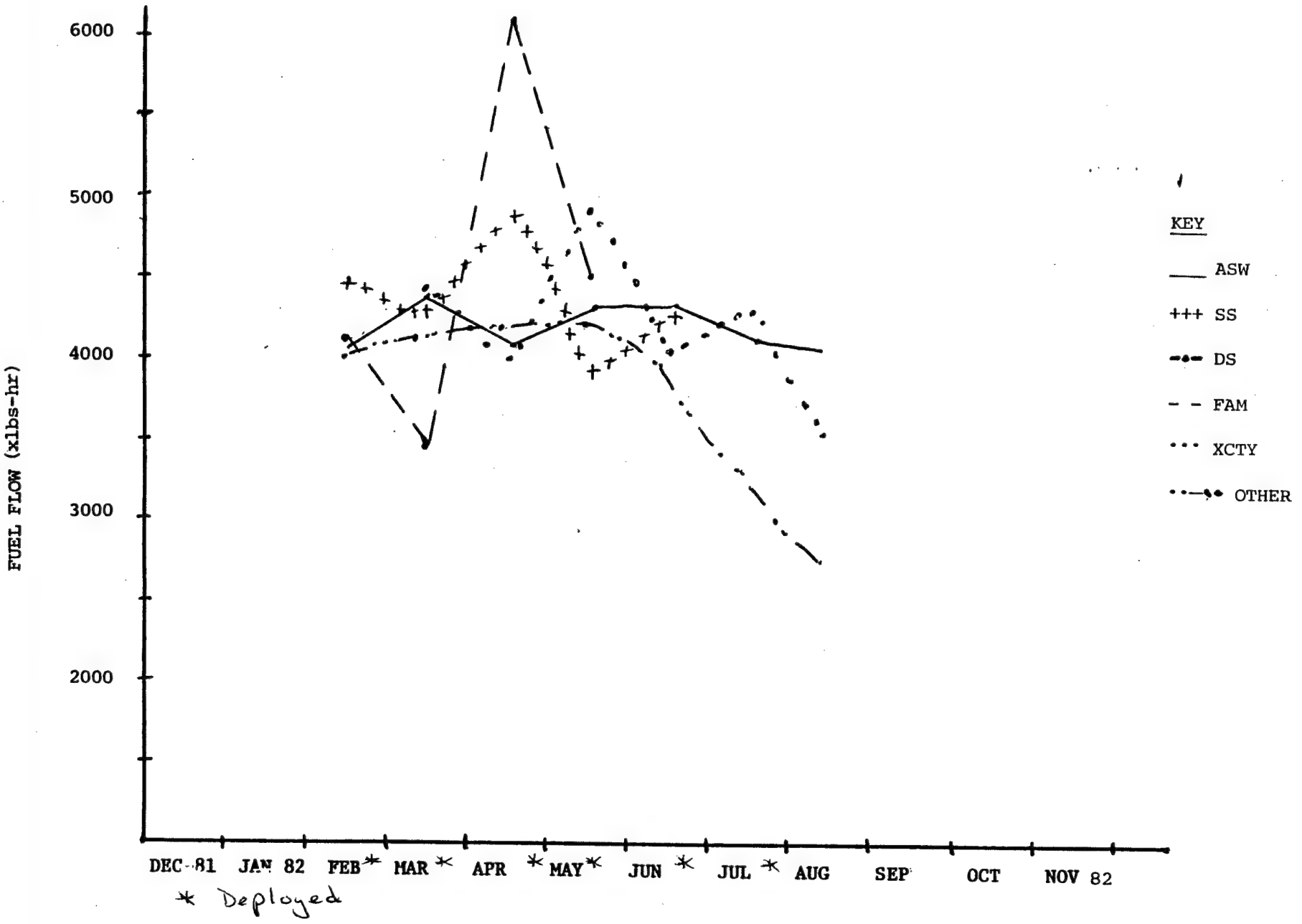


FIGURE D-9 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON D

MONTH	PREFLIGHT		CLIMB		CRUISE-OUT		ONSTATION		CRUISE-IN		DESCENT		POSTFLIGHT	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81														
JAN 82														
FEB *	168	5	7120	15	5371	21	4128	20	6420	4	2646	19	2122	19
MARCH *	225	16	7797	19	4869	19	3799	16	8940	3	5978	19	2109	19
APRIL *	540	32	6745	51	5705	50	4736	47	5743	7	4116	48	3211	46
MAY *	180	36	7494	47	5521	43	4651	37	5656	11	2676	38	2386	35
JUNE *	466	22	7133	41	4624	43	4785	35	6504	5	2253	40	1965	40
JULY *	328	13	7049	21	5936	30	3905	24	4980	2	2466	20	2208	25
AUGUST	210	6	6084	10	3930	8	3120	4	7740	1	2280	5	1990	6
SEPT														
OCT														
NOV 82														

* Deployed

TABLE D-3 AVERAGE FUEL FLOW BY MISSION PHASE-SQUADRON D

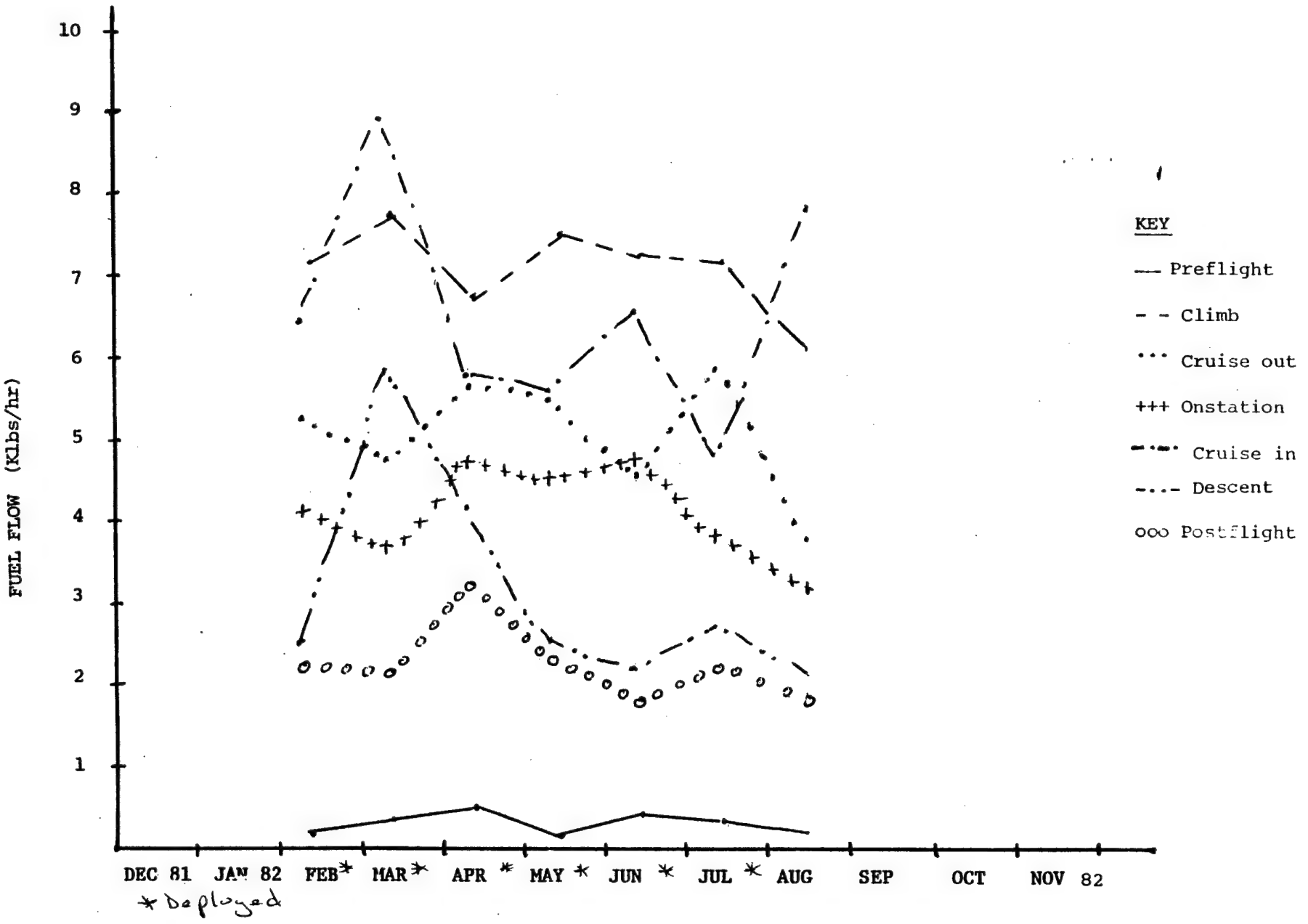
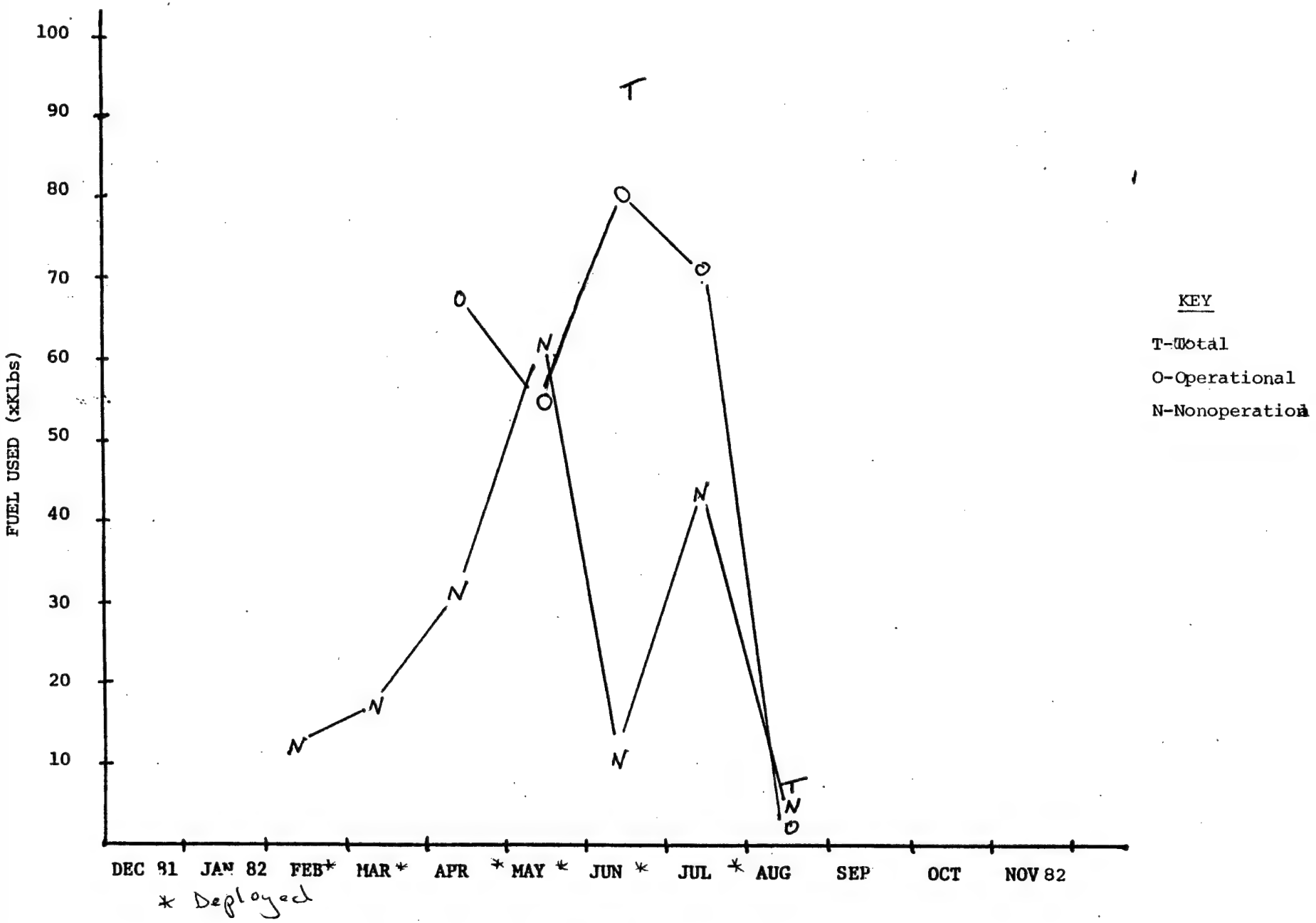


FIGURE D-10: FUEL FLOW BY MISSION PHASE - SQUADRON D

MONTH	TOTAL FLIGHTS	% FLIGHTS NON OP	% FLIGHTS NON OP GSE USED	AVER NON OP P/F(hr)	PROJECTED NON OP FUEL (lbs)	AVER OP P/F (hrs)	PROJECTED OP FUEL (lbs)	TOTAL P/F FUEL (lbs)
DEC 81								
JAN82								
FEB *	130	13	8	2.8	13,440	3.2	108,480	121,920
MAR *	152	24	17	2.2	19,800	3.2	111,360	131,160
APR *	128	37	11	2.6	32,760	3.0	68,040	100,800
MAY *	129	49	10	3.7	63,270	2.8	55,440	118,710
JUN *	117	24	0	1.5	12,600	3.0	80,100	92,700
JUL *	126	28	10	5.0	46,500	2.6	70,980	117,480
AUG	13	80	25	1.7	4080	2.2	1980	6060
SEP								
OCT								
NOV 82								

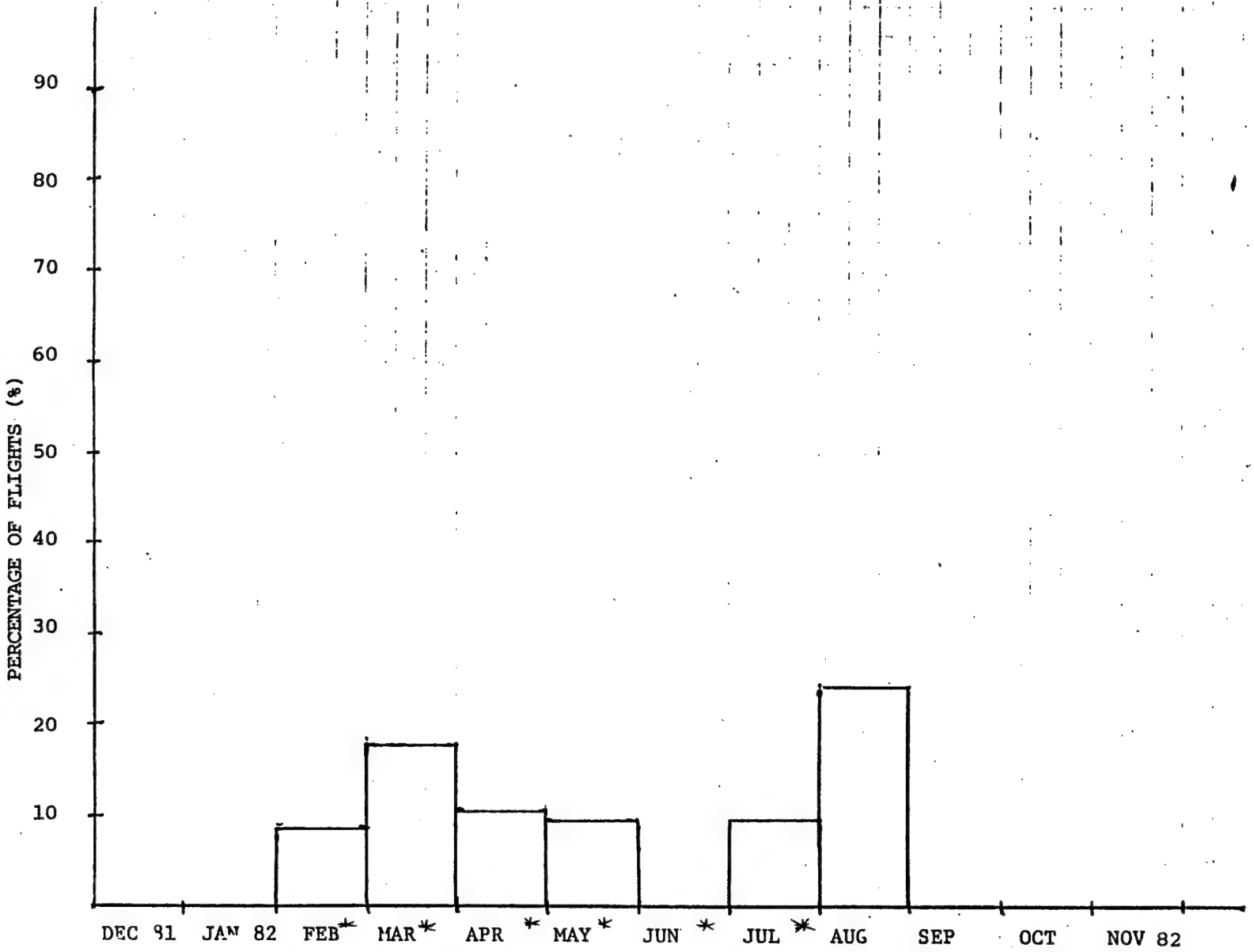
* Deployed

TABLE D-4 PROJECTED APU FUEL USED DURING PREFLIGHT (lbs)- SQUADRON D



NOTE: Numerous TOTAL fuel used during preflight exceeds scale.

FIGURE D-11 PROJECTED APU FUEL USED DURING PREFLIGHT-SQUADRON D



* Deployed

FIGURE D-12 PERCENT OF NON OP FLIGHTS USING GSE AT PREFLIGHT - SQUADRON D

MONTH	0 ENGINES LOITERED		1 ENGINE LOITERED		2 ENGINES LOITERED	
	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES
DEC 81						
JAN 82						
FEB *	32	7	64	14	5	1
MAR *	17	3	61	11	22	4
APR *	22	11	57	29	22	11
MAY *	24	9	63	24	13	5
JUN *	24	9	66	25	11	5
JUL *	20	5	80	20	0	0
AUG	50	1	50	1	0	0
SEP						
OCT						
NOV 82						

* Deployed

TABLE D-5 PERCENTAGE AND NUMBER OF OCCURANCES OF 0,1 and 2 ENGINE LOITERED ONSTATION (OPERATIONAL FLIGHTS) — SQUADRON D

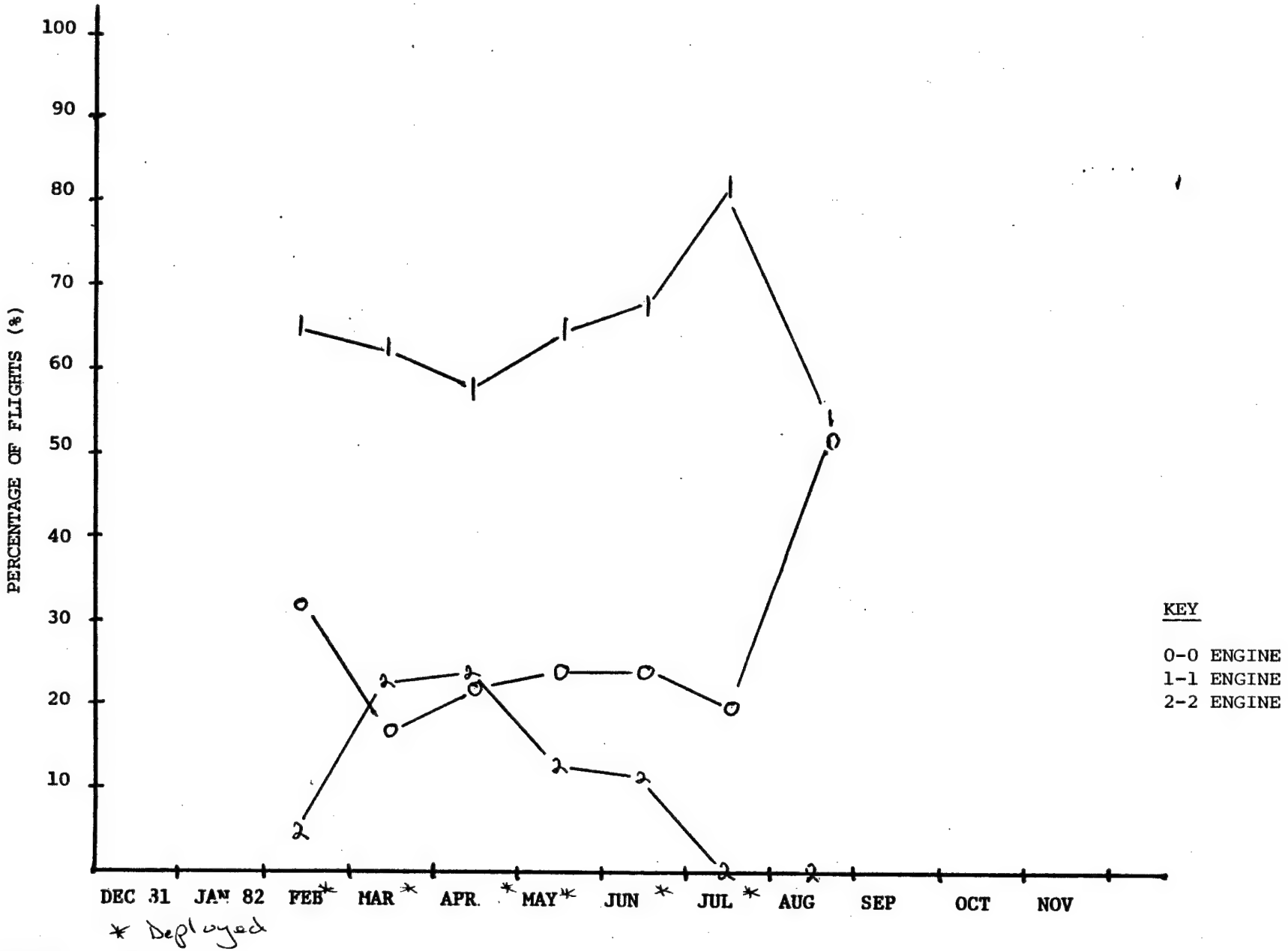


FIGURE D-13 ONSTATION ENGINE LOITER PERCENTAGE (OPERATION FLIGHTS) - SQUADRON D

MONTH	TOTAL FLIGHTS (YELLOW SHEET)	AVERAGE TAXI TIME (min)	ENGINE ON PRIOR TO TAXI (%)			PROJECTED FUEL (lbs)		
			2 ENG	3 ENG	4 ENG	TAXI 2+3 +4 ENGINE	TAXI 2 ENGINE	SAVINGS
DEC 81								
JAN 82								
FEB *	130	9	91	5	5			
MAR *	152	7	68	5	27			
APR *	128	10	56	10	34			
MAY *	129	7	62	8	30			
JUN *	117	8	68	4	28			
JUL *	126	7	50	9	41			
AUG	13	9	42	8	50			
SEP								
OCT								
NOV 82								

PROJECTED FUEL CONSUMED DURING TAXI NOT CALCULATED

* Deployed

TABLE D-6 PROJECTED FUEL SAVINGS DURING TAXI-SQUADRON D

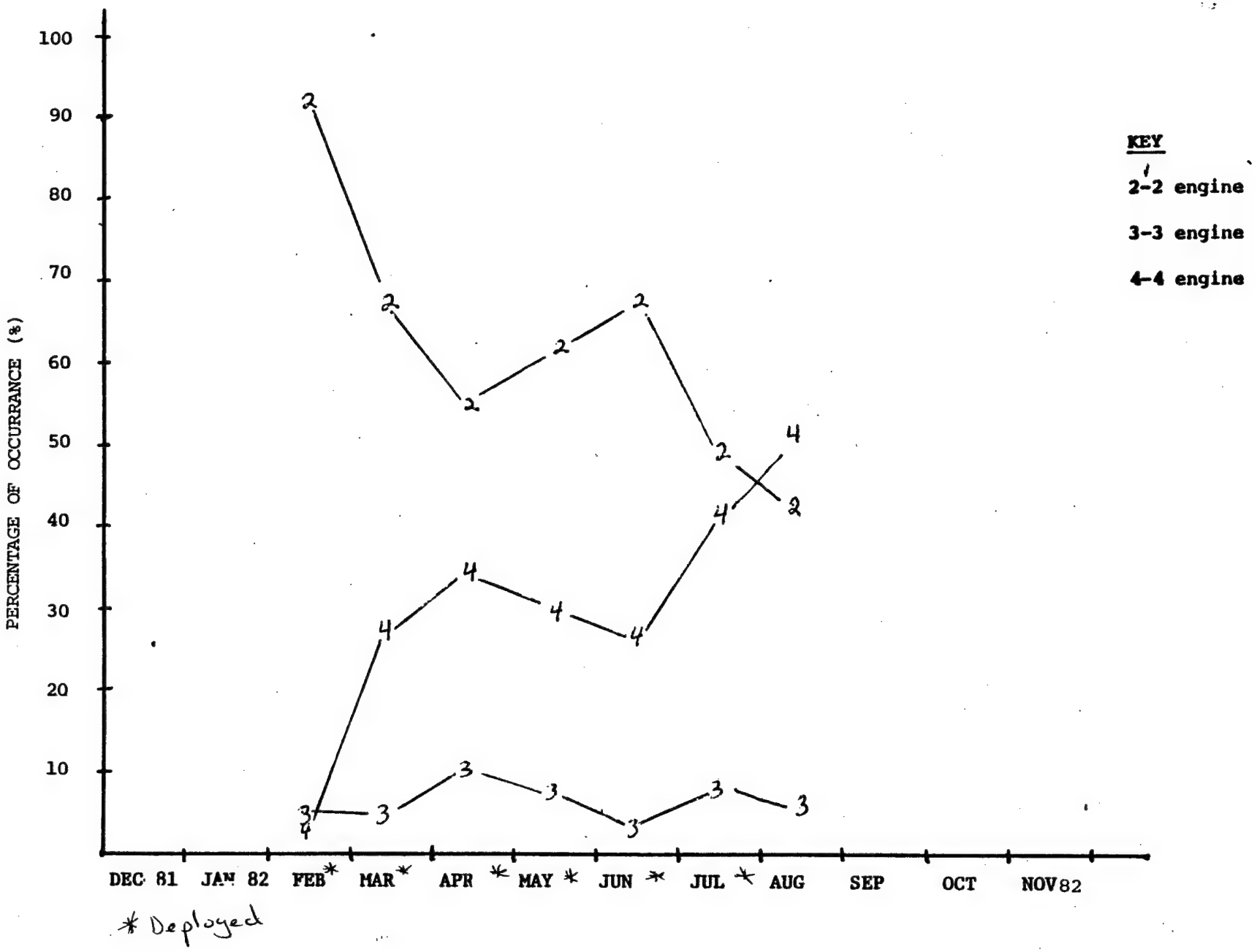


FIGURE D-14 ENGINES ON PRIOR TO TAXI — SQUADRON D

APPENDIX E

SQUADRON E FUEL USAGE BREAKDOWN

MONTH	AVERAGE EXCESS FUEL (lbs)	STANDARD DEVIATION	SAMPLE SIZE	AVERAGE FLIGHT TIME DEVIATION (hrs)	STANDARD DEVIATION	SAMPLE SIZE
DEC 81						
JAN 82						
FEB						
MAR						
APR	4300	3700	40	-.4	1.6	40
MAY	4000	4000	58	-.2	.7	58
JUN	6859	6682	96	-1.1	1.9	98
JUL	4489	4824	48	-.7	1.1	50
AUG	4300	5400	71	-.4	1.9	77
SEP						
OCT						
NOV 82						

TABLE E-1 - AVERAGE EXCESS FUEL AT LANDING AND PLANNED VS. ACTUAL FLIGHT TIME DEVIATION - SQUADRON E

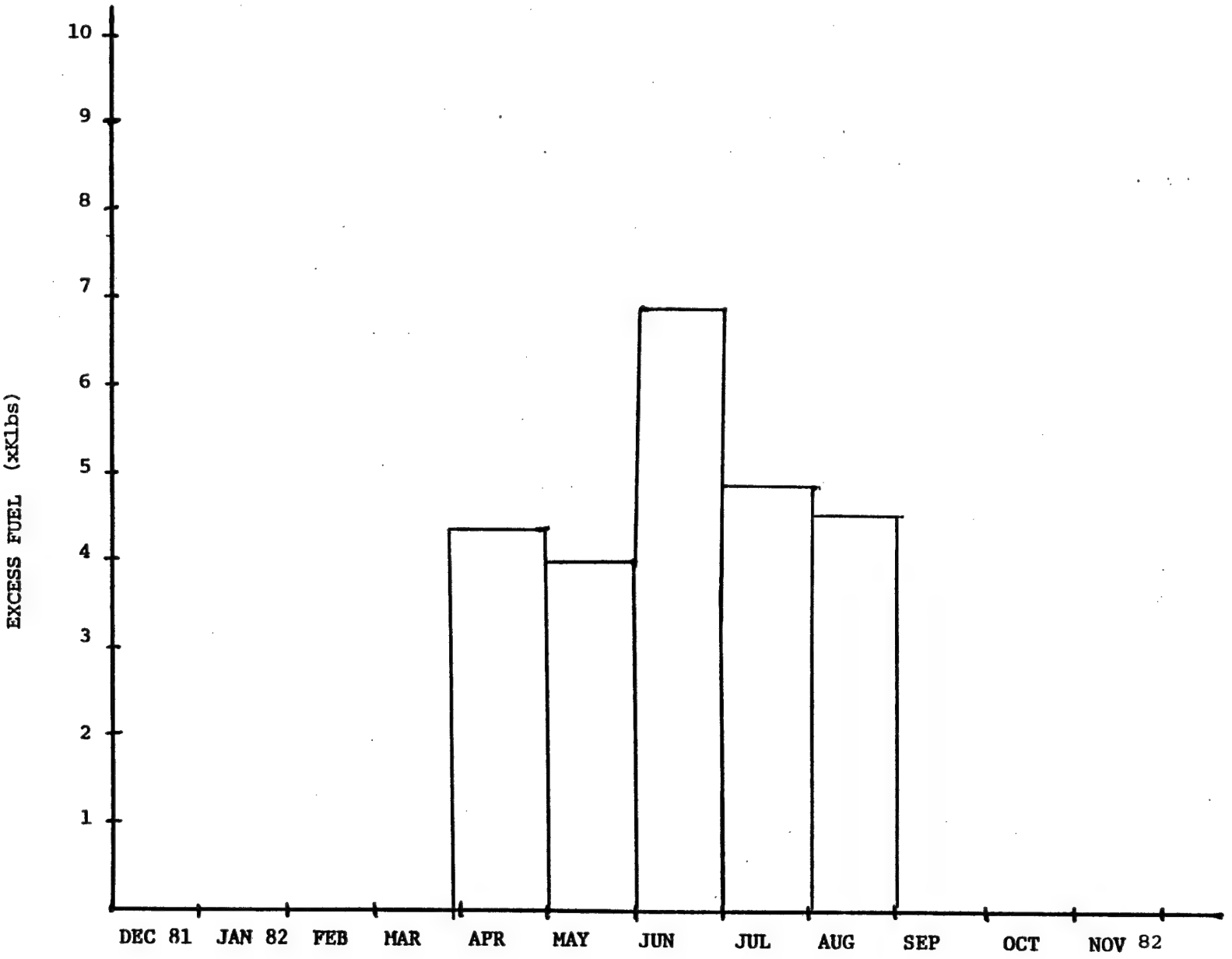


FIGURE E-1 AVERAGE EXCESS FUEL AT LANDING-SQUADRON E

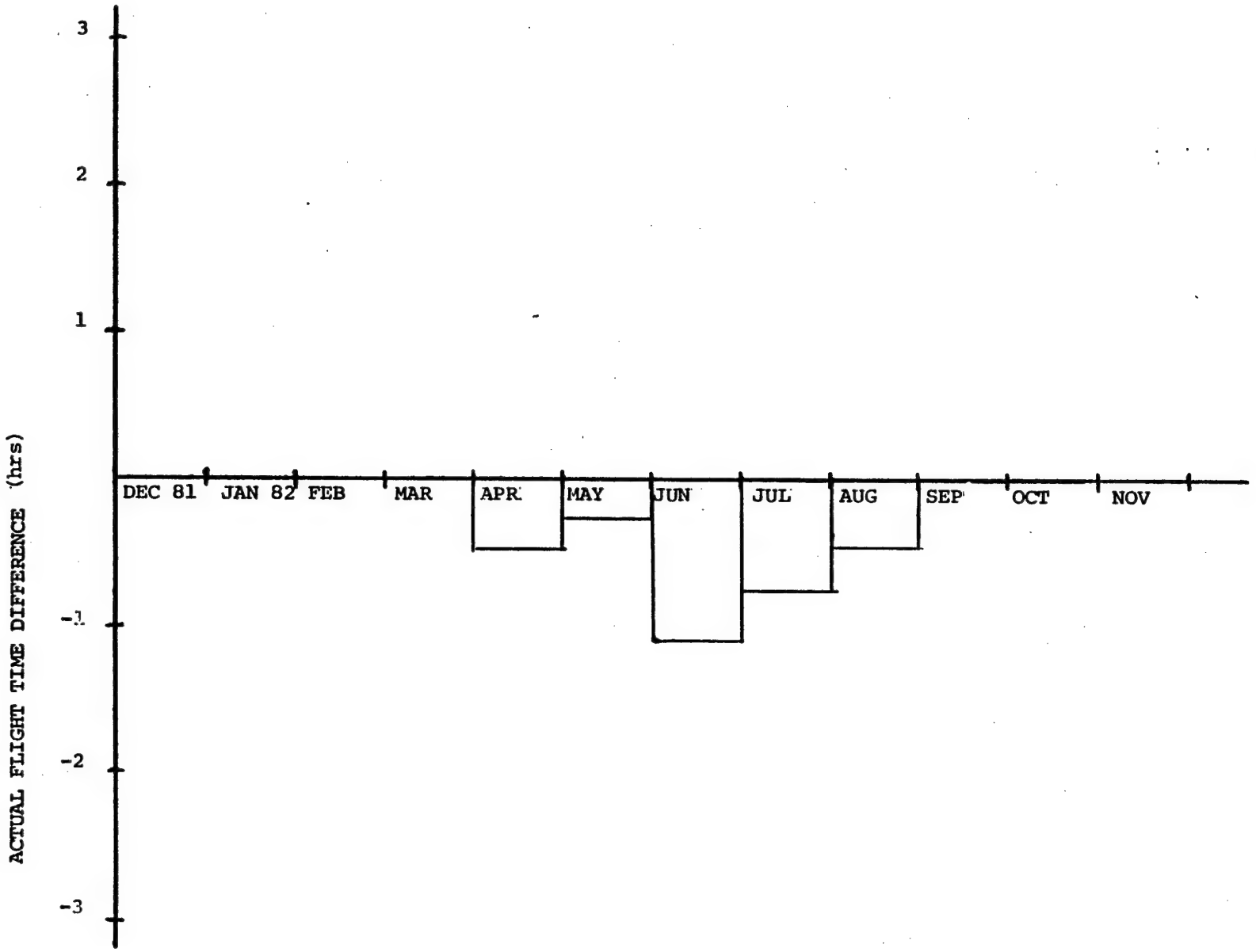


FIGURE E-2 : AVERAGE FLIGHT TIME DEVIATION PLANNED VS. ACTUAL FLIGHT TIME – SQUADRON E

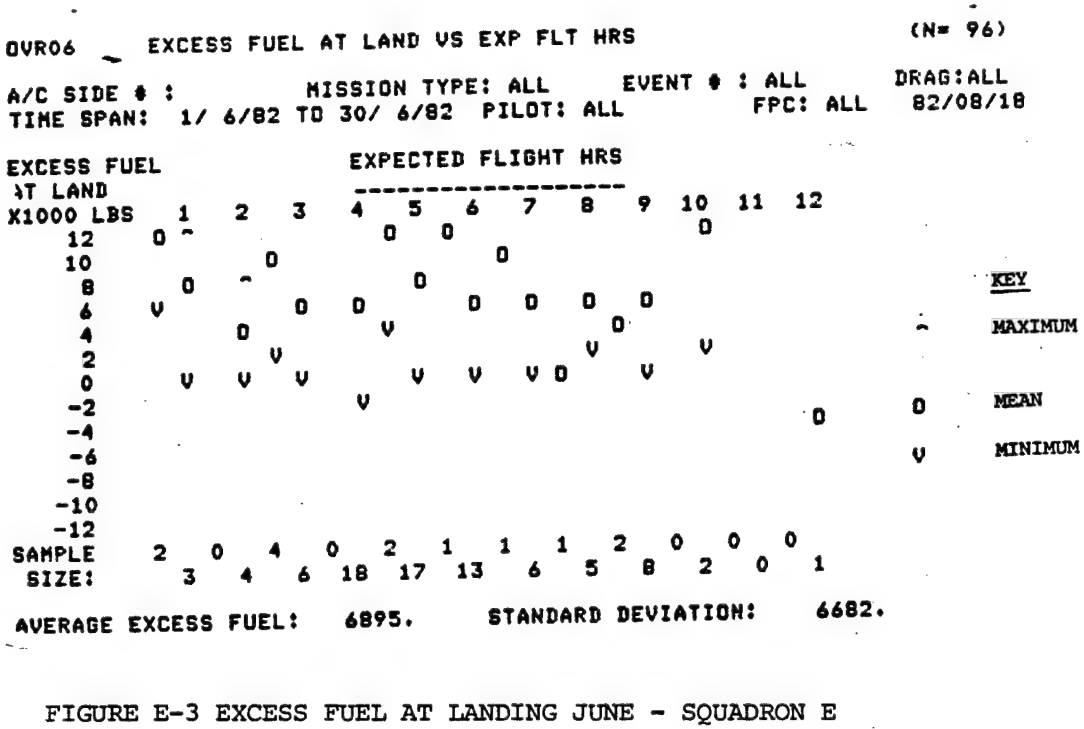


FIGURE E-3 EXCESS FUEL AT LANDING JUNE - SQUADRON E

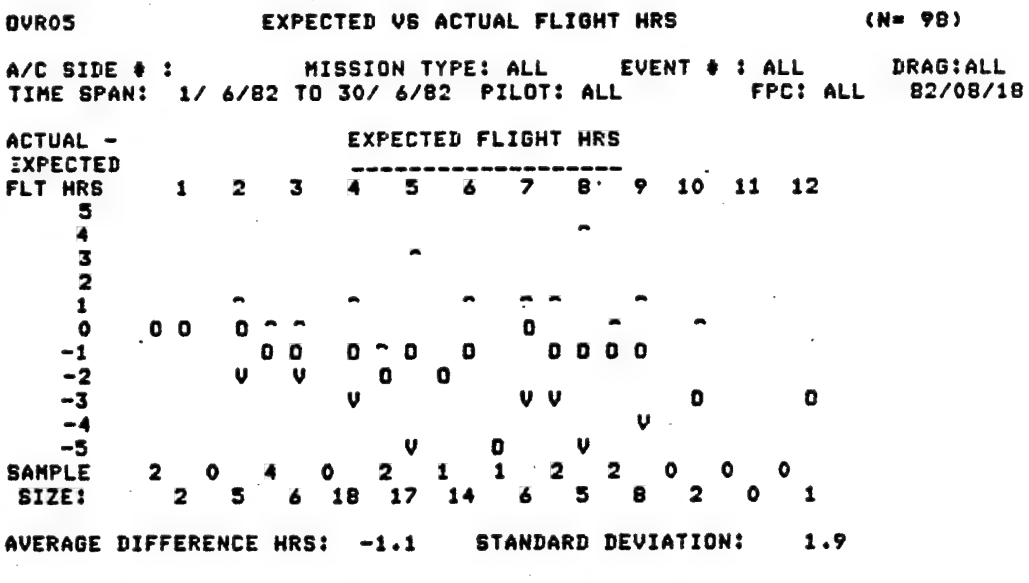


FIGURE E-4 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JUNE - SQUADRON E

```
DVR06 -  EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 48)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 29/ 7/82  PILOT: ALL          FPC: ALL   82/08/24

EXCESS FUEL              EXPECTED FLIGHT HRS
AT LAND                  ------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12          0           ^                   0
    10                                  0
     8                  0
     6              0   0
     4                      0   ^ 0 ^   0
     2                      0   0                       0
     0              0       V           0
    -2              V V   V
    -4
    -6
    -8
   -10
   -12
SAMPLE    0   0   1   2   1   0   1   1   0   0   0   0
 SIZE:      0   0   1  18  12   2   3   1   3   1   0   1
```

FIGURE E-5 EXCESS FUEL AT LANDING JULY - SQUADRON E

```
DVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 50)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  1/ 7/82 TO 29/ 7/82  PILOT: ALL          FPC: ALL   82/08/24

ACTUAL -                 EXPECTED FLIGHT HRS
EXPECTED                 ------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4
     3
     2
     1                  ^   ^   ^           ^
     0              0       0   0 0 0   0   0
    -1          0   0           V
    -2        0           ^ V   V     0
    -3                  V 0                         0
    -4
    -5
SAMPLE    0   0   1   2   2   0   1   1   0   0   0   0
 SIZE:      0   0   3  19  12   2   3   1   2   0   0   1

AVERAGE DIFFERENCE HRS:   -.7    STANDARD DEVIATION:    1.1
```

FIGURE E-6 ACTUAL VS. PLANNED FLIGHT TIME VARIATION JULY - SQUADRON E

```
OVR06     EXCESS FUEL AT LAND VS EXP FLT HRS                    (N= 71)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  2/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL   82/09/22

  CESS FUEL              EXPECTED FLIGHT HRS
..  LAND                 --------------------
X1000 LBS   1   2   3   4   5   6   7   8   9  10  11  12
    12          ^           0
    10
     8              ^   0       0       0 ^
     6                  0   ^
     4          0 0 0       0   ^   ^       0 ^
     2      0       V           0 0     0       0
     0          V           V           V 0 V V
    -2                  V       V
    -4
    -6                                                  0
    -8
   -10                                                      0
   -12
SAMPLE    0   0   2   0   1   1   3   0   1   3   0   0
 SIZE:      1   4   4  24   5   6   1   8   3   2   1   1

AVERAGE EXCESS FUEL:   4343.     STANDARD DEVIATION:    5441.
```

FIGURE E-7 EXCESS FUEL AT LANDING AUGUST - SQUADRON E

```
OVR05              EXPECTED VS ACTUAL FLIGHT HRS              (N= 77)

A/C SIDE # :          MISSION TYPE: ALL     EVENT # : ALL       DRAG:ALL
TIME SPAN:  2/ 8/82 TO 31/ 8/82  PILOT: ALL          FPC: ALL   82/09/22

  TUAL -                 EXPECTED FLIGHT HRS
_..PECTED                --------------------
FLT HRS     1   2   3   4   5   6   7   8   9  10  11  12
     5
     4          0       ^               ^
     3                      ^
     2
     1                  ^       0   0   ^   ^
     0      0   0   0           0 0         0   ^ 0   0
    -1          V V   0 0 0   V       V       0         0
    -2                  V                   0 V
    -3                  V   V 0
    -4
   ; -5
SAMPLE    0   0   2   0   3   2   3   0   1   3   0   0
 SIZE:      1   4   4  23   5   6   1   8   5   4   1   1

AVERAGE DIFFERENCE HRS:   -.4    STANDARD DEVIATION:    1.9
```

FIGURE E-8 ACTUAL VS. PLANNED FLIGHT TIME VARIATION AUGUST - SQUADRON E

MONTH	ASW		SS		DS		FAM		XCTY		OTHER	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81											1	
JAN 82												
FEB												
MAR												
APR	4180	6	4376	2	4154	6	4674	19	4360	8	4249	7
MAY	4363	21	4418	2	—	0	4252	15	4174	20	4291	18
JUN	4262	27	4104	3	4385	1	4077	35	4525	13	4487	22
JUL	4159	15	4508	1	—	0	3701	19	4371	14	4104	5
AUG	4172	21	4255	2	—	0	3970	25	3779	20	3462	8
SEP												
OCT												
NOV 82												

TABLE E-2 AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE – SQUADRON E

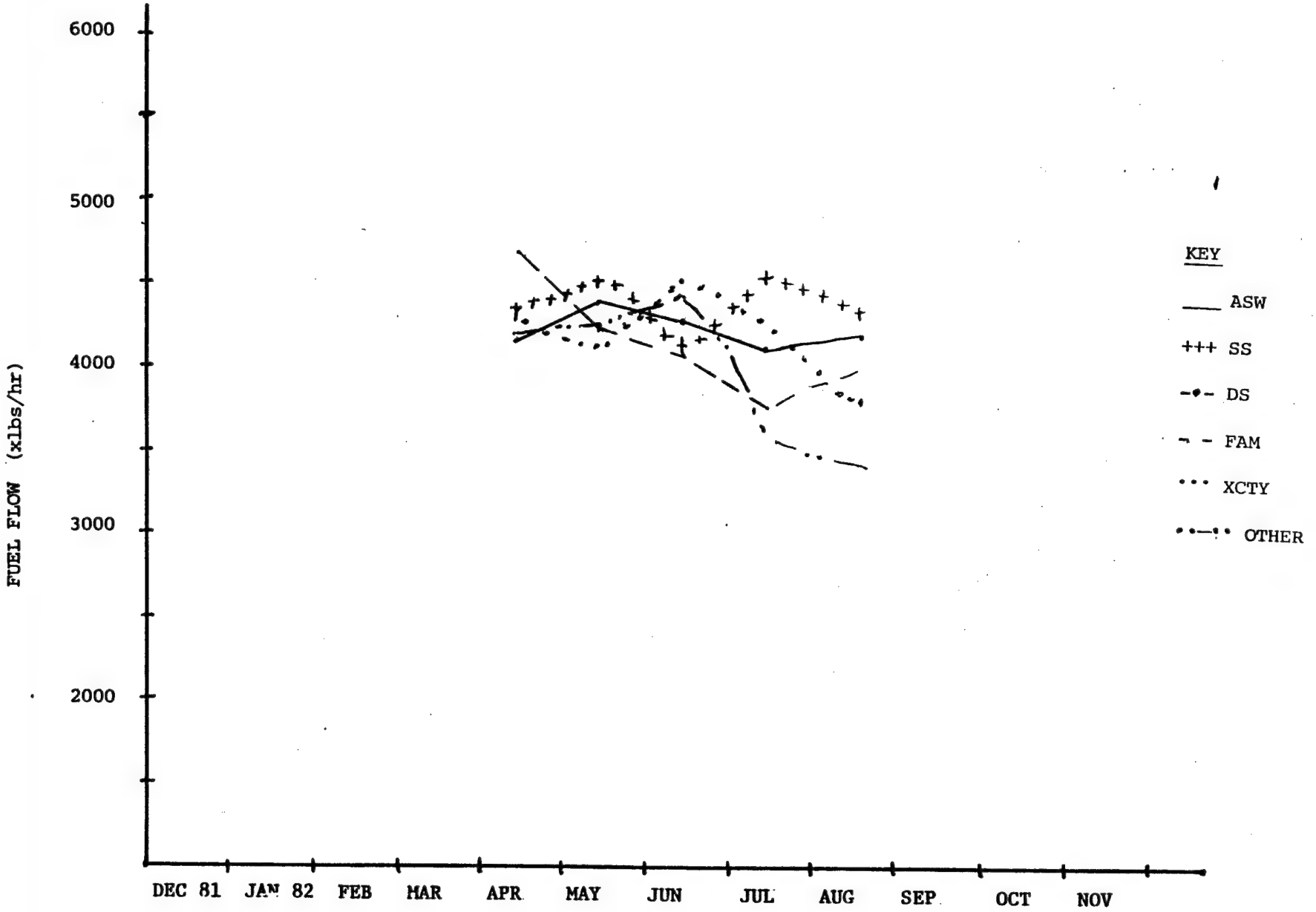


FIGURE E-9 · AVERAGE INFLIGHT FUEL FLOW BY MISSION TYPE - SQUADRON E

MONTH	PREFLIGHT		CLIMB		CRUISE-OUT		ONSTATION		CRUISE-IN		DESCENT		POSTFLIGHT	
	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE	FUEL FLOW	SAMPLE SIZE
DEC 81													1	
JAN 82														
FEB														
MAR														
APR	—	0	7835	29	4823	21	4061	16	4920	1	3788	24	1971	42
MAY	233	58	7830	60	4809	48	4133	25	5843	5	3448	32	2269	62
JUN	376	49	7118	51	4924	43	4432	30	7100	6	3245	37	2182	73
JUL	180	43	6876	32	4213	18	4648	13	6080	3	4503	22	2103	43
AUG	211	64	6507	44	4325	37	4025	22	6380	6	2994	29	2452	69
SEP														
OCT														
NOV 82														

TABLE E-3 AVERAGE FUEL FLOW BY MISSION PHASE-SQUADRON E

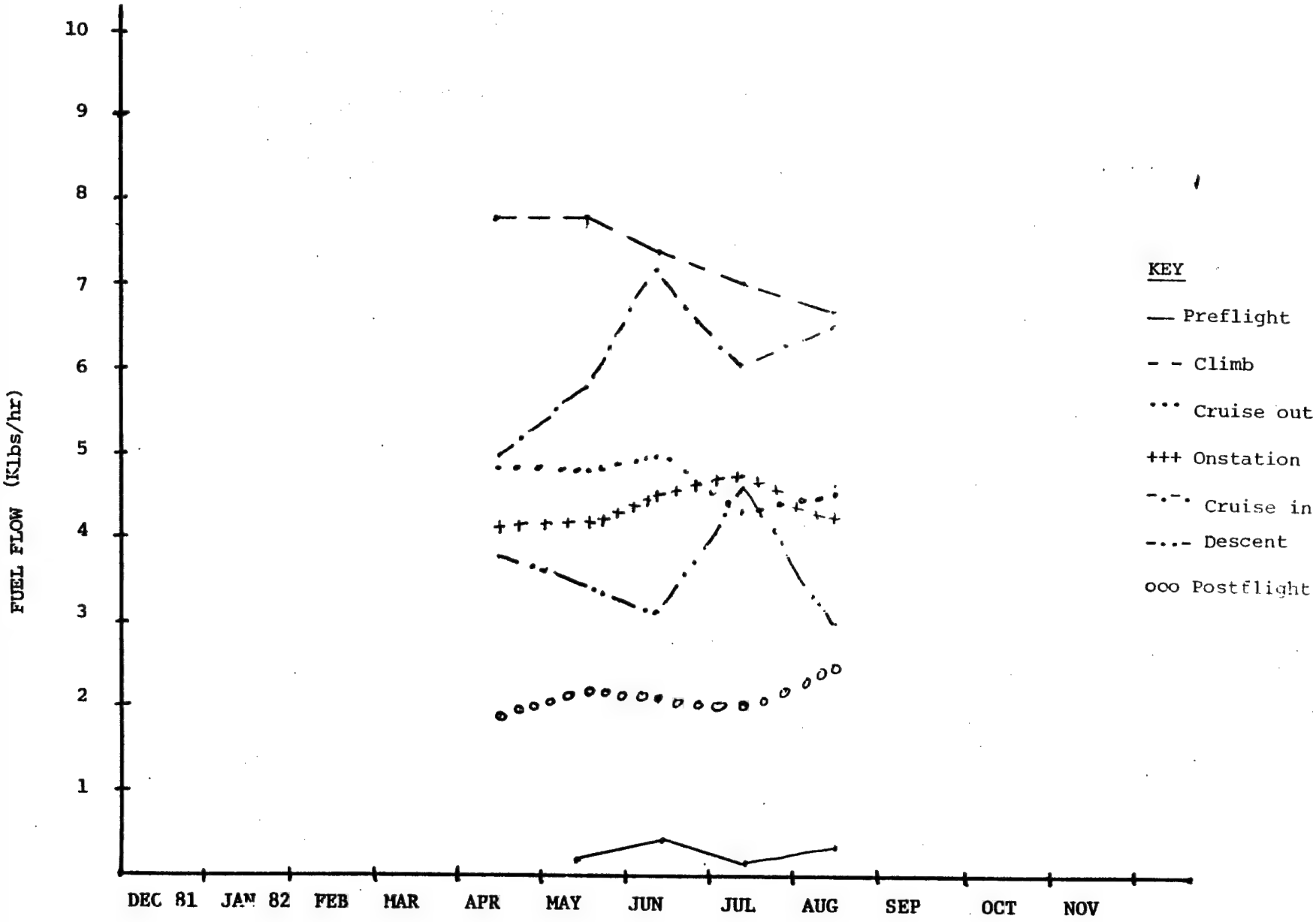


FIGURE E-10 FUEL FLOW BY MISSION PHASE – SQUADRON E

MONTH	TOTAL FLIGHTS	% FLIGHTS NON OP	% FLIGHTS NON OP GSE USED	AVER NON OP P/F(hr)	PROJECTED NON OP FUEL (lbs)	AVER OP P/F (hrs)	PROJECTED OP FUEL (lbs)	TOTAL P/F FUEL (lbs)
DEC 81								
JAN82								
FEB								
MAR								
APR	67	65	37	1.7	14,280	2.7	18,630	32,910
MAY	99	70	3	2.6	52,260	3.1	29,760	82,020
JUN	114	70	57	2.6	26,520	3.2	32,640	59,160
JUL	82	70	13	2.6	39,000	3.2	24,000	63,000
AUG	115	69	2	2.6	60,060	3.5	37,800	97,860
SEPT								
OCT								
NOV 82								

TABLE E-4 PROJECTED APU FUEL USED DURING PREFLIGHT (lbs)-SQUADRON E

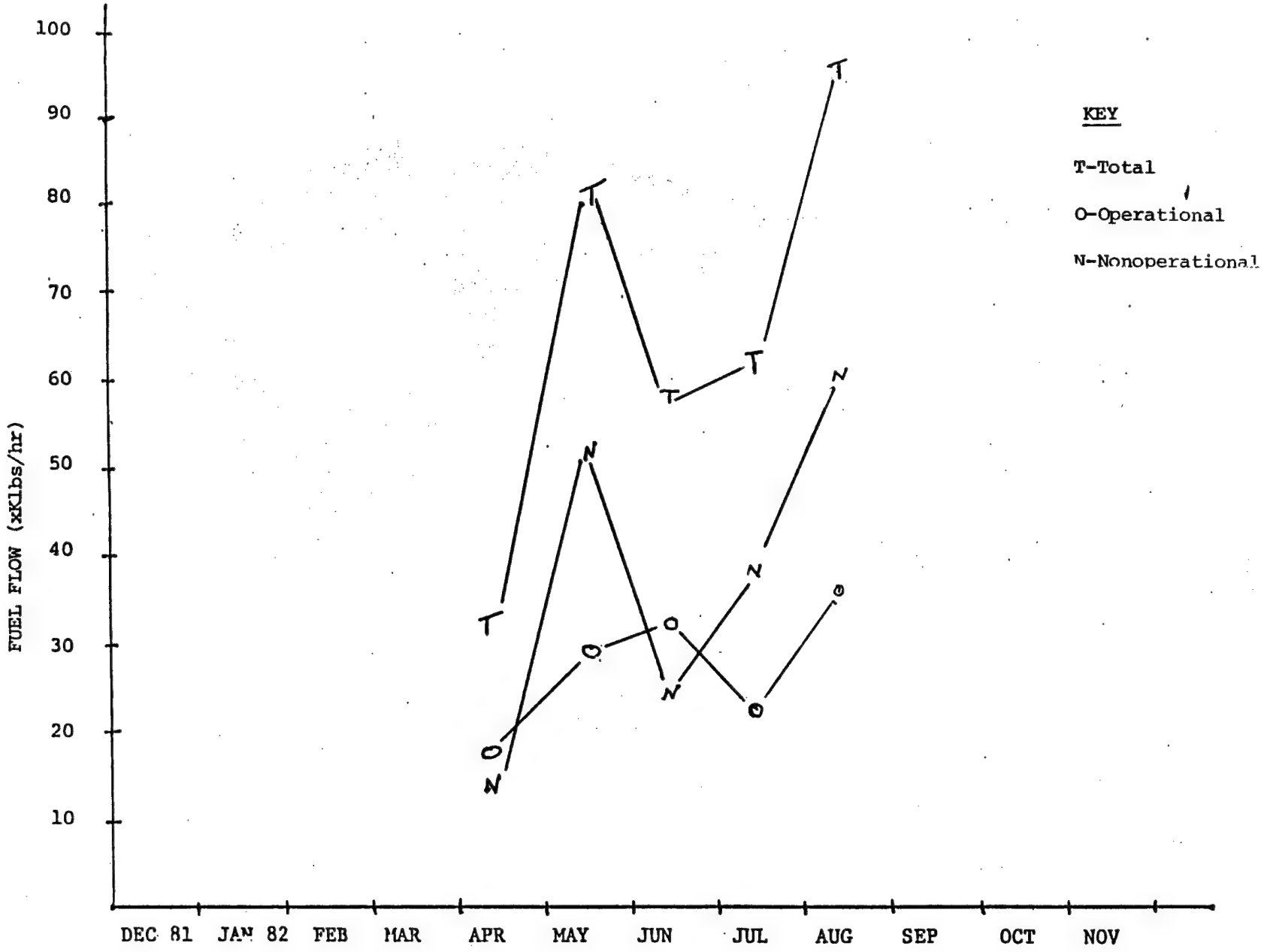


FIGURE E-11 PROJECTED APU FUEL USED DURING PREFLIGHT-SQUADRON E

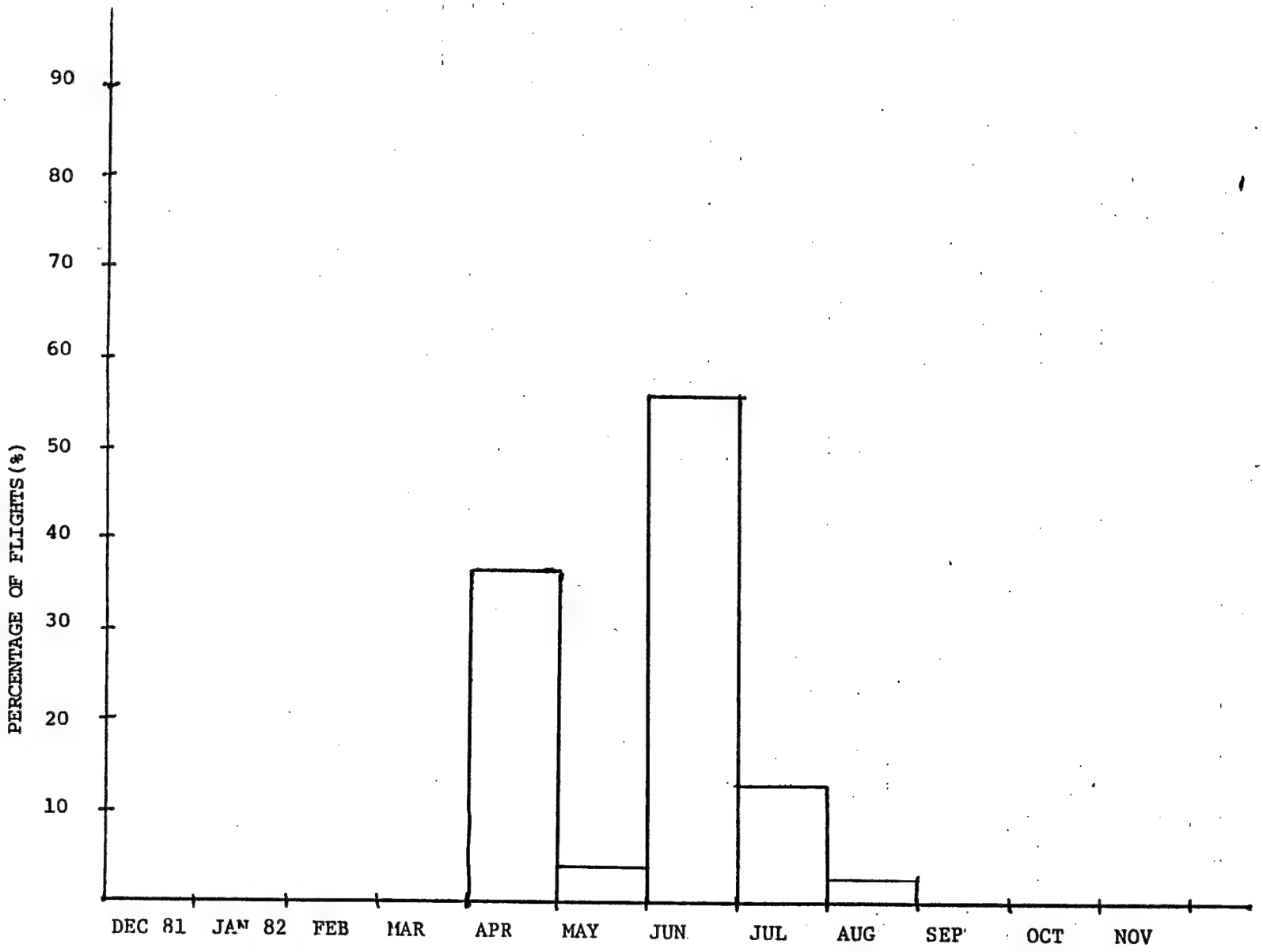


FIGURE E-12 PERCENT OF NON OP FLIGHTS USING GSE AT PREFLIGHT - SQUADRON E

MONTH	0 ENGINES LOITERED		1 ENGINE LOITERED		2 ENGINES LOITERED	
	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES	% FLIGHTS	SAMPLES
DEC 81						
JAN 82						
FEB						
MAR						
APR	6	1	94	17	0	0
MAY	10	3	86	25	4	1
JUN	7	2	81	25	4	13
JUL	8	1	92	12	0	0
AUG	0	0	95	19	5	1
SEP						
OCT						
NOV 82						

TABLE E-5 PERCENTAGE AND NUMBER OF OCCURANCES OF 0,1 and 2 ENGINE LOITERED ONSTATION (OPERATIONAL FLIGHTS) - SQUADRON E

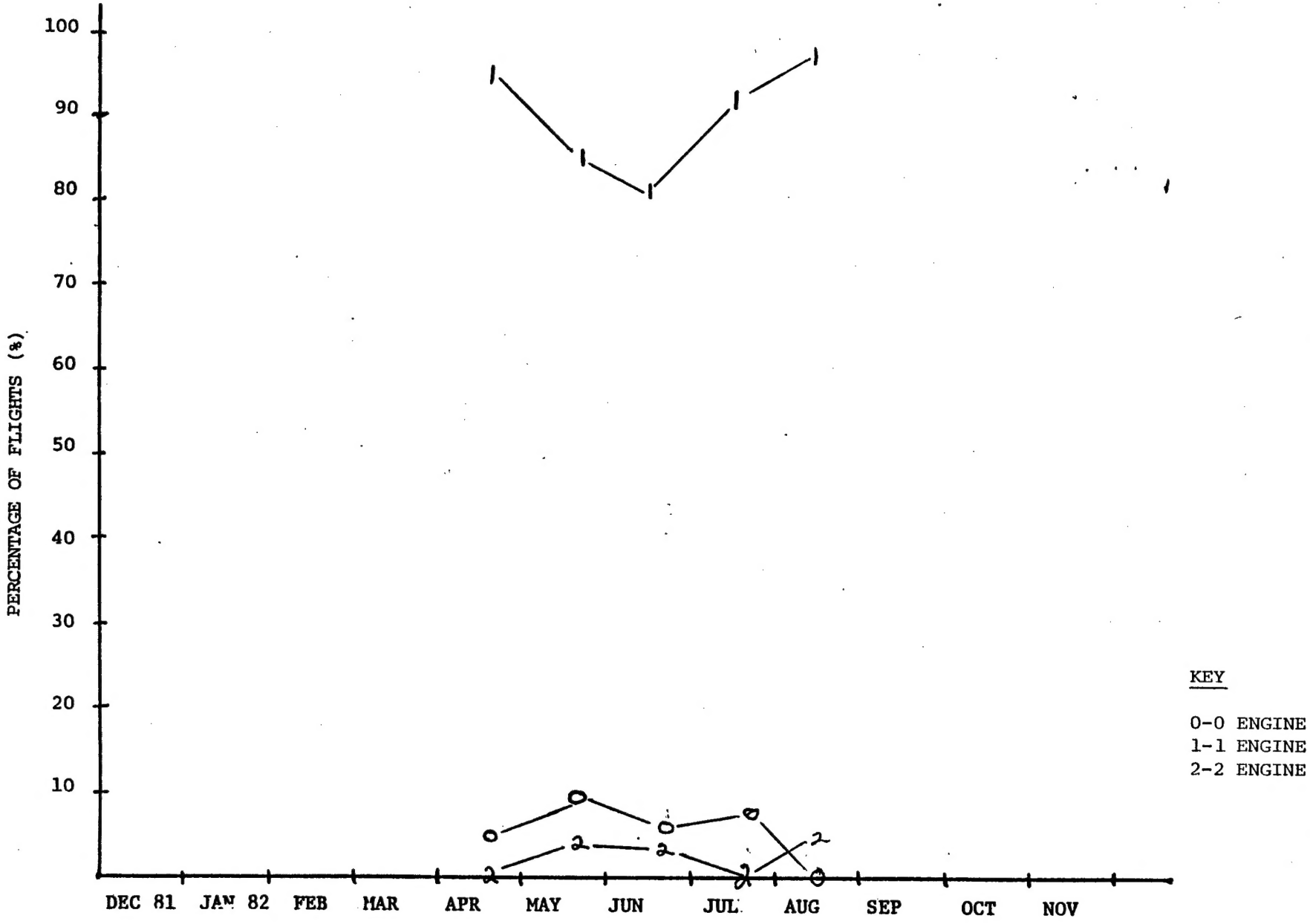


FIGURE E-13 ONSTATION ENGINE LOITER PERCENTAGE (OPERATION FLIGHTS) – SQUADRON E

MONTH	TOTAL FLIGHTS (YELLOW SHEET)	AVERAGE TAXI TIME (min)	ENGINE ON PRIOR TO TAXI (%)			PROJECTED FUEL (lbs)		
			2 ENG	3 ENG	4 ENG	TAXI 2+3 +4 ENGINE	TAXI 2 ENGINE	SAVINGS
DEC 81								
JAN 82								
FEB								
MAR								
APR	67	11	11	2	87			
MAY	99	7	16	3	81			
JUN	114	9	16	3	81			
JUL	82	10	40	2	58			
AUG	115	9	34	1	64			
SEP								
OCT								
NOV 82								

PROJECTED FUEL CONSUMED DURING TAXI NOT CALCULATED

TABLE E-6 PROJECTED FUEL SAVINGS DURING TAXI - SQUADRON E

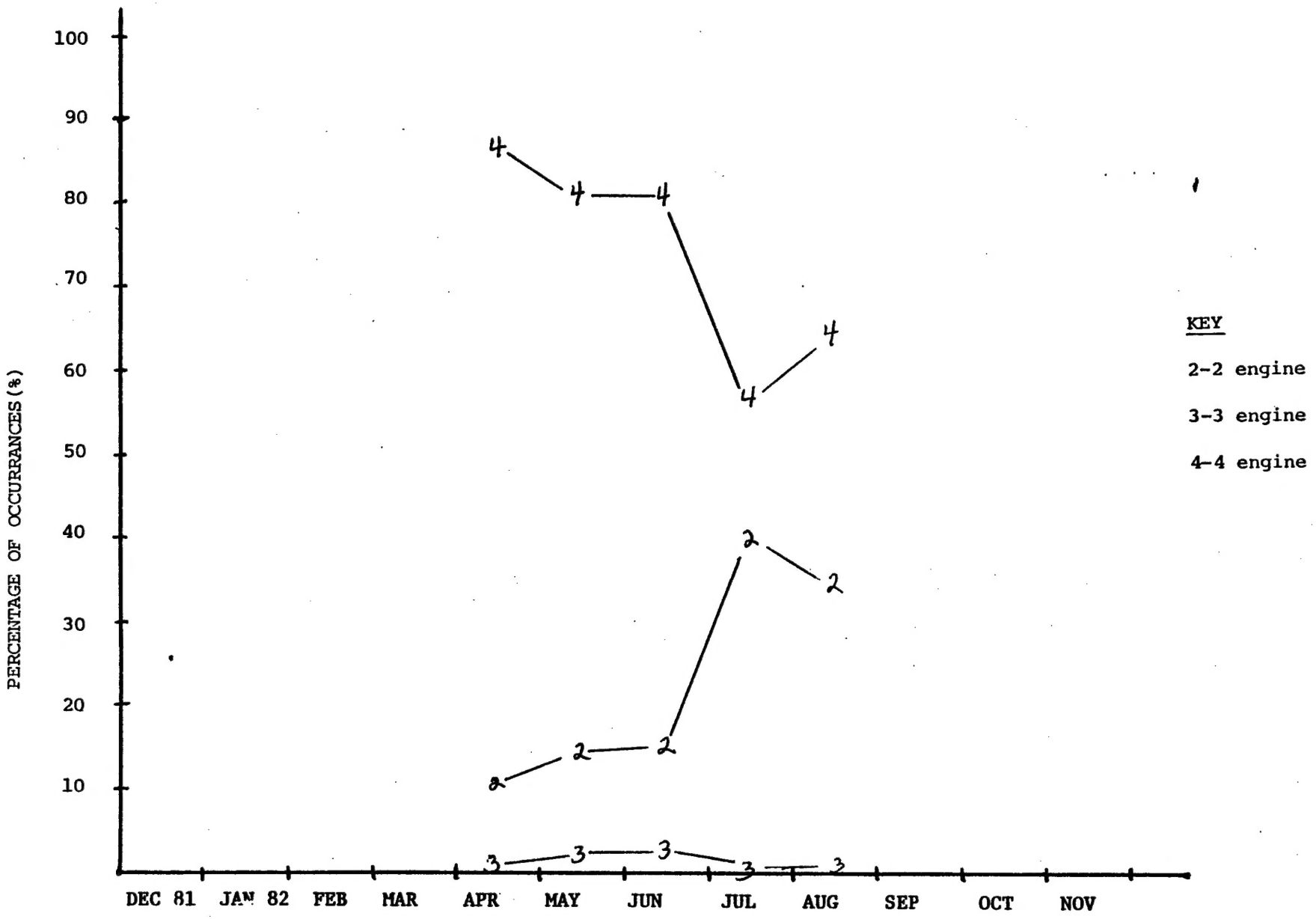


FIGURE E-14 ENGINES ON PRIOR TO TAXI – SQUADRON E